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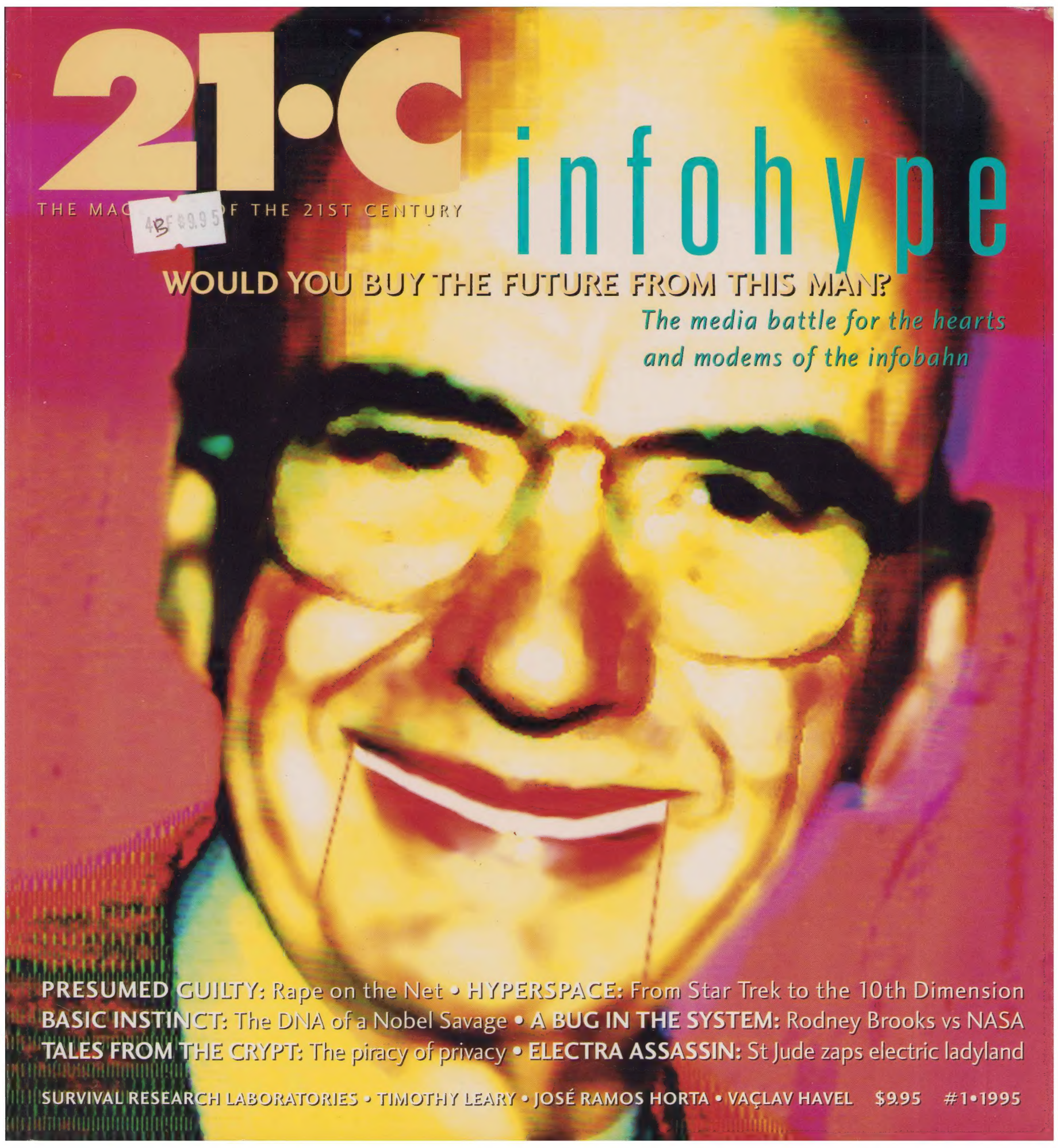

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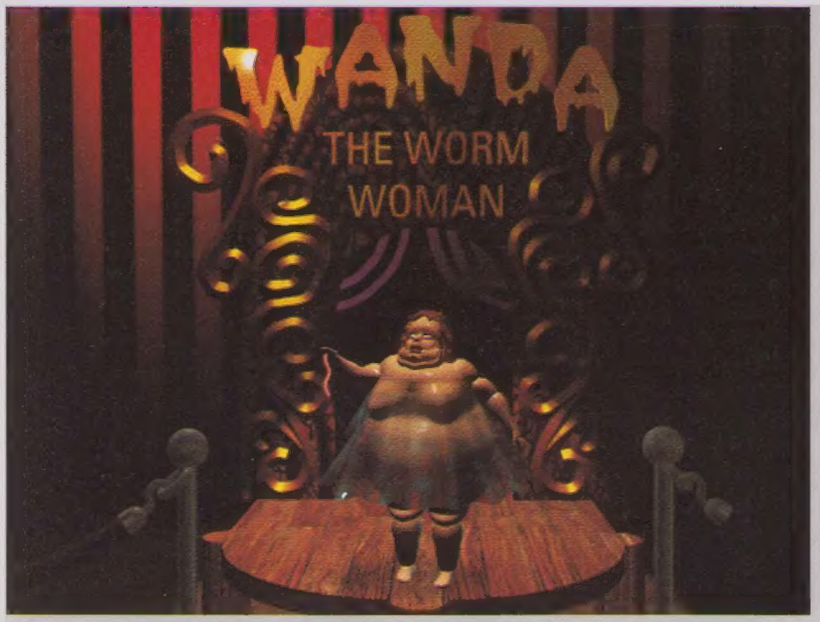

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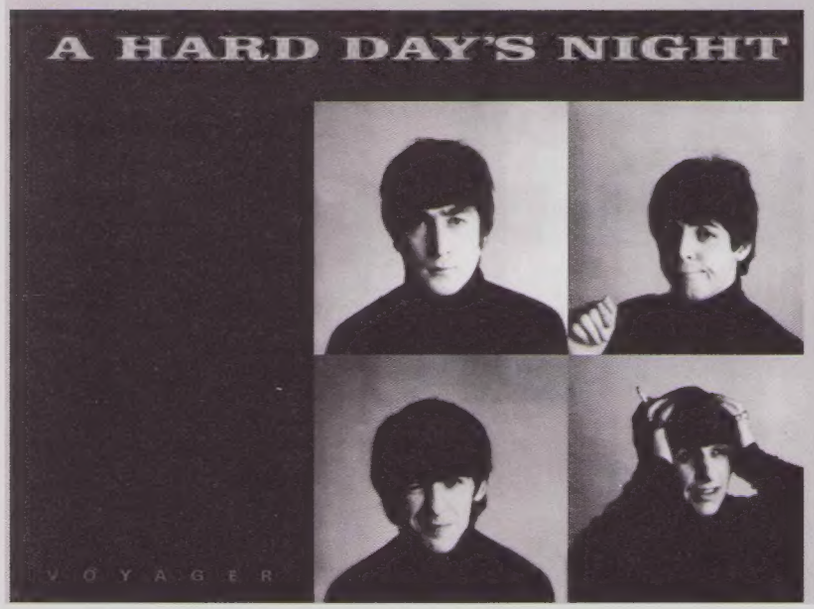

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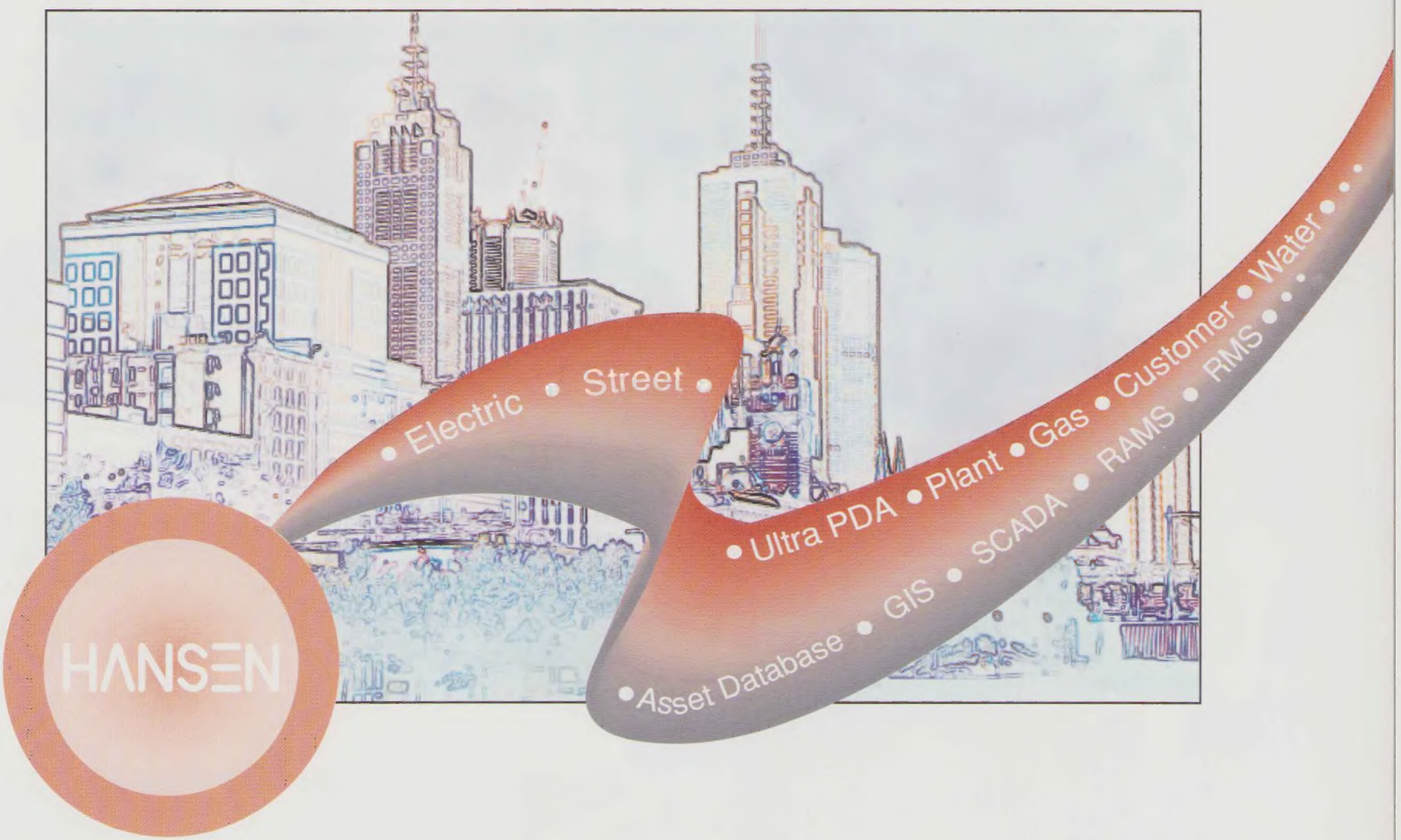

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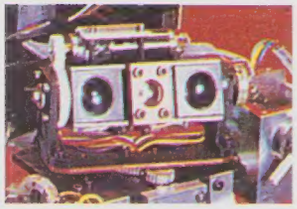

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21•C, The Magazine of the 21st Century, is published quarterly by Fine Arts Press Pty Ltd, a subsidiary of G+B Arts International Ltd, in association with the Australian Commission for the Future Ltd. ISSN 10356754.

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What ever happened to the asexual, bespectacled science nerd? Dr Kary Mullis, the Nobel Prize-winning biochemist who made the replication of DNA strands as easy as programming your microwave, is not exactly your ivory tower of discipline and single-minded dedication to science. An unemployed surfer partial to red wine and slim blondes, Mullis is more testosterone than test tube, as reporter Emily Yoffe discovers first-hand. But then nowadays we know that even Einstein was a womaniser with a fixation for Marilyn Monroe.

Then there's Rodney Brooks, the ingenious roboticist who decries NASA for its lack of vision, and dubs competing artificial intelligence researchers as third-rate. Mark Kestigian found Brooks in dubious temper, teetering on the edge of becoming a victim of NASA funding cutbacks, while racing to create the most accomplished robotic explorers ever.

While generally insightful, some scientists are a little eccentric, as the extensive interview with Dr Timothy Leary reveals. From his ground-breaking psychotherapy and notorious LSD experimentation to the wide open frontiers of cyberspace, Leary's synapses are still firing and his life in science – often dogged by controversy – shows the *métier* of a visionary.

All three are unarguably brilliant. But discovery is a human activity, and pioneers are allowed the same healthy collection of idiosyncrasies as the rest of us. Maybe an even healthier collection. The stereotype of the wild-eyed, frizzy-haired scientist playing with test-tubes still permeates society, but is as out of date as the notion that political leaders are model citizens.

In this issue, *21•C* again previews the next millennium. Philosopher-king Vaçlav Havel, architect of the so-called Velvet Revolution and now President of the Czech Republic, pinpoints the dilemma of our times – "when everything is possible yet nothing is certain" – and sketches a vision of the future.

On the more immediate future, Timorese resistance leader José Ramos Horta predicts the inevitable freeing of East Timor from its Indonesian occupiers. He also answers many claims made by David Lange on the role of the United Nations made in the last issue of *21•C*.

Then there's the flame-throwing robots of performance-art group Survival Research Laboratories, battling each other in noisy spectacles that comment on contemporary society at the end of the 20th century.

As the media giants do battle for the Infobahn's promise of riches, McKenzie Wark dissects the hype and warns: beware of flashy new info technologies dressed up as neural nirvanas.

21•C also looks at the male dominance of the Net and women's attempts to make cyberspace egalitarian, while Net-Fem St Jude flames those who seek to drown out diversity in the matrix.

Spies fighting to gain a foothold on the Net. Hyper-universes of 10 dimensions. Travel at speeds faster than light. Time warps that take you to the edge of infinity. Just where is it heading? *21•C* doesn't promise to predict the future. But it does try to recast contemporary realities. The rest is up to you.

Ashley Crawford **Wilson da Silva** **Ray Edgar**

Next issue: Carl Sagan sketches a vision of humans colonising Mars; Adam Penenberg looks at the battle to control high-definition television; Michio Kaku, Paul Davies and Stephen Wynberg debate the Theory of Everything.

RETRO-DESIGNS ARE INFILTRATING TODAY'S GADGETRY. BUT CAN PAST TENSE BE FUTURE PERFECT?

products that eco the past

BY FRED HARDEN

In a digital world, being 'analogue' is the ultimate cool. Valve amps are beloved by hi-fi buffs who claim their sound has that special something – despite reproducing music that has been totally recorded and mastered digitally. Petrol heads lust for a mechanical link between foot and carburettor that bypasses their V8's electronic fuel injection. Now companies are recognising the basic requirements of the enthusiast and are producing hi-tech objects with an old world sensibility. But there is more to it than the cultural element.

The digital wristwatch had its 15 minutes of fame before hiding its computer chip face behind its hands, showing that sometimes an analogue dial can convey information that a pure numeric read-out can't.

Nikon's analogue dial on its latest fixed-lens cameras has shades of Leica's early design.

This is the thinking behind Nikon's latest objects of photographic desire, the 28Ti and 35Ti. Two fixed-lens cameras (with 28mm and 35mm razor-sharp Nikkor optics respectively) that combine digital control with a stunning retro-design dial. There are undertones of the early Leica designs here – a touch of historic Japanese irony – but these are superbly made, titanium-body cameras that have all the modern point-and-shoot features, such as auto-focus and zone auto-exposure, both with full manual override and flash. The 28Ti also has a panoramic image option. All this is packaged with Nikon style, and priced accordingly (street prices will be around $1,200 for the 28Ti). And there's a digital date stamp with that ugly little LED character set if the analogue bit starts to pall.


Casio's magic diary

While the Casio Wrist Commander (that's the one with the built-in infra-red remote that can control your TV, VCR and stereo) is an elegant technical device, an elegant watch it's not. If you are too embarrassed to wear it in front of your Tag-wristed friends, consider pocketing Casio's Secret Sender 6000 Diary instead, which follows on the overseas success of Casio's My Magic Diary, one of the hottest toys in the U.S. last Christmas selling almost 200,000 units (eat your heart out, Apple Newton!). Basically it's a PDA for kids that can activate a TV or VCR.

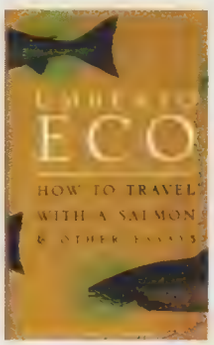
The Secret Sender electronic digital diary (selling for US$99.95 suggested retail, and available in Australia by the time you read this) lets kids communicate with one another via infra-red signals up to a distance of eight metres, using built-in messages or with your own messages on a 16-character by four-line display. It can also transfer data to other Casio Databanks with an optional cable.

Coming from the impeccably named Casio Cool Toy Division and intended for children between 8 and 13, these electronic diaries offer kids the same technology as adults, but in a fun way. The fun elements of the Secret Sender include a phone directory with what looks like an identikit 'Face Maker', which allows the child to create faces of their friends to store alongside the telephone number – useful if you forget the name but never the face. There are also 'Fortune Telling' and 'Match Maker' features and a 'Secret Password' section, all in a character set for 14 languages that will output messages in English, French, German, Italian, Spanish, Danish, Dutch, Finnish, Swedish and Portuguese. Then add in the time in 29 different time zones (including 27 cities) via a scrolling world map. It also provides for reminder memos, a calendar with cartoon pictures for sports, homework, hobbies, a schedule alarm, a 10-digit calculator and a currency converter. If you buy one each for your kids, you will need one for yourself to send them important messages of parental authority such as "Do your homework", and "Go to bed" (in Finnish), before turning off their television. Beam me up, Noddy.

Umberto Eco's new book of 'divertissements' *How to travel with a salmon* (Secker & Warburg, $26.95) has an essay on "How to Buy Gadgets" prompted by the kind of merchandising catalogues that you get with your credit card statements. My favourite of these, which I've saved in disbelief at its historical phase shift, was the Edison phonograph replica, complete with wind-up handle, reproduction eight-inch bakelite horn and a 'natural wood' case that houses a CD player. The products are easy targets for wit, and Eco has a lot of fun with them.

If you can identify with the prospect of finding an item of such amazing utility and value that it forces you into a buying frenzy, then tense-up, the equivalent can be found as close as your computer. The missing element in on-line shopping has always been those glossy photographs. If you are going to spend hundreds of dollars to buy an item that you can't examine, you are not going to buy it sight unseen. Downloading graphics on a modem while you are paying for connect time, takes the fun of browsing out of the process. The best of the current solutions is to use a CD-ROM for the colour images, and link it with an on-line ability; you can then check latest prices and order if you so choose.

Umberto Eco muses on hi-tech anachronisms in his essay "How to buy gadgets".



In a digital world, being analogue is the ultimate cool

CompuServe, the grand-daddy of on-line services, has long had an Electronic Mall for shopping. Because of their size and international coverage they attract major U.S. stores such as J.C. Penney, all offering products that can be ordered with a credit card. They are understandably strong in computer products, but also attract the usual American mix of off-the-wall stuff. The bi-monthly CompuServe CD-ROM extends the on-line service by adding, to quote the blurb, "650 megabytes of entertainment, value, and convenience: free updates, shareware programs, demos of commercial software, preview music from upcoming albums, the latest in new media technology and trends, travelogues, multimedia-style shopping catalogues, and more". It is all done with considerable Windows style.

The links back to the on-line sections of CompuServe are its strength, and the hardware manufacturer forums offer terrific after-sales support. CompuServe members outside the U.S. and Canada can only buy single issues; in Australia, they're only $12.95 plus $2 shipping and handling. You can join CompuServe Pacific on-line and then order the CD-ROM, or contact Fujitsu Australia Ltd on 008 025 240 for more details.

Local Australian prices and products are the strength of Sydney company InfoMagic, who offer the Macintosh-only InfoExpress™ CD-ROM. This "Superstore on your desktop" offers you "The Power of Digital Selling"™ in a "Superstore that never closes". There are Screen Images™ of over 2,500 software products, including upgrades, network licences, and educational items. The disc includes animated promos, some usable demos and an attractive interface. There's no on-line support, but you can use your computer to search for reviews of the computer products, culled from IDG's *Macworld* and *PC World* magazines. The company assures that the product supplied will always be the latest model or software version. When you order (by phone or fax only) you also earn 'frequent buyer points' towards holidays and consumer and household goods. The CD-ROM is free and you can order one from 008 804 895.

Why trudge to the mailbox when you can lean back, laugh and let your keyboard do the walking. ■

E-Mall: the shopping centre of the future is being conducted via CD-ROM attracting major U.S. stores such as J.C. Penney all offering products that can be ordered via credit card.

FROM TOASTER WORSHIP TO THE STARSHIP ENTERPRISE, SCREENSAVERS ARE THE MINDLESS FASHION ACCESSORY OF THE ULTIMATE COMPUTER NERD.

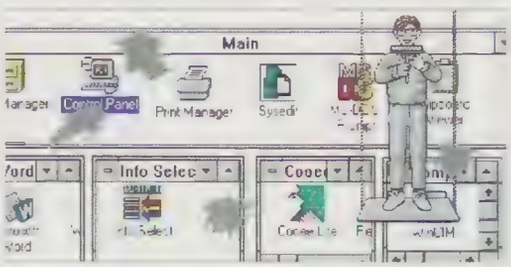
screen savour

BY FRED HARDEN

If the world can be divided into those who like Barry Manilow and those that hate him, with computers the equivalent is those that use screensavers and those that don't.

It takes days to burn-in a fixed image on the new colour screens, so I've always wondered about the justification for the hours spent in modifying screensaver files and tinkering with screen wallpaper. There's enough visual clutter already on my desk. Then a friend requested a replacement for the interminable swans that were gliding past on the new Windows networked computer that was just installed on her desk. She explained she was not opposed to wildlife (although her ornithological screen interest runs more to Alex Proyas' *The Crow*), it was just the desire to one-up the rest of the office with something that affirmed all those perfectly acceptable '90s principles. She wanted to be seen as individual, computer smart, and to display a graphic sensibility that rose above tropical fish.

In hope of enlightenment I set off on the search.



Bill Gates Does Windows

Is there anybody in there?

Some of the best screen software plays with the notions of real 'outside' and the virtual 'inside' world of your computer. In *Bill Gates Does Windows*, a *MacUser* magazine joke, you choose how dirty the mud splashes on the inside of the screen will be, and Bill on a scaffold scrapes them clean with a squeegee. You also change how often he nervously pushes his glasses back up his nose as he works, a characteristic Gates mannerism.

On the Mac there's an old favourite called *Rage*. Run it and with each mouse click, there's a gunshot sound, punching a magnum bullet hole in the screen which then trickles blood. It's satisfying if a little disturbing in its lack of gun-lobby correctness. If you register your shareware version, you can choose other ways of Mac screen destruction such as an Uzi or a shotgun.

Of all the ways to 'destroy' your screen, *Decay1* results in a *House of Wax* finale. Use this and whatever image is on-screen distorts, icons melt and it all runs in technicolour down to the bottom of the monitor. The version shown here is one of the many variations of the program that was originally developed for Unix workstations. One description touts it as a terrific practical joke to install on a friend's computer. The next time the screensaver kicks in and they look back at the screen, it's not hard to imagine the effect. Do we need to institute codes of acceptable behaviour for devotees of screensavers? Perhaps a 'Thou Shalt Not' commandment on installing graven screensavers on your neighbours PCs.

We have control

Even more disturbing is a trend to advertising, thus realising the sales potential of that small glowing billboard on your desk. Coke, Pepsi and Ford all have give-away product promotion versions that can be downloaded from most bulletin-boards (which is the best way to find the quirky ones). Most of these corporate sponsored versions wander across your screen free, but you have to pay for the small pink Eveready Bunny to amuse you with it's never tiring meanderings. There are also multimedia versions that make full use of your sound card and take up yards of hard-disc real-estate to play flickering Quicktime or Video for Windows images. Because of the demands for processor speed and space (screensavers are supposed to be background events after all), most screensavers are animated and the graphic objects they move around are small.

Toaster worship

Pop culture groupies are well served, with images from *Star Trek*, *The Simpsons*, Marvel Comics, and *The Flintstones* currently jostling for monitor space. A number of these run from the most well known of the many commercial screensaver programs, *After Dark*. The flying toaster is the archetypal screensaver image and its creator, Berkeley Systems, are the commercial success story of the screensaver cult, definitely High Church.

Berkeley have recently released *After Dark* Version 3.0 for Mac and Windows, and reportedly have a programming team of over a dozen designers and animators working on keeping the images fresh. They also run a competition each year with cash prizes to entice outside contributions.

Melting moments in Decay

You know you are a success when you are parodied by others. A screensaver from Delrina, featuring Berkeley Breathed's U.S. cartoon strip characters Opus and Bill, was withdrawn from sale when Berkeley Systems sued to stop Delrina's Bill character from standing with a shotgun at the bottom of the screen and shooting down the winged toasters as they passed overhead. The revised 'censored' version has the toasters flying by helicopter power rather than on wings. However, the legal action uncovered the fact that *After Dark*'s toaster image looked suspiciously like the cover of an old Jefferson Airplane album; the band's lawyers are now interested in talking about copyright.

After Dark 3.0 has sophisticated control panels, with Hot Keys and Hot Zones in the corners of your screen so you can engage the saver instantly without waiting for the 'sleep' timer. You can combine and randomise the different images, turn them into wallpaper, and make a choice of background music. The program can detect when system activity is limited but when you mightn't want to lose the screen (while printing for example). This new version also boasts a power manager called EcoLogic. If you have an Energy Star compliant monitor, like any of the new NEC range, the screensaver can power off your monitor, and on the Mac, it can also turn your computer off.

A screen saver that turns itself off? Now that's a bizarre enough double-bind to attract the attention of even the most disinterested computer meta-theoretician. And they want you to pay to turn your screen off. Save me! ■

A ladybug

The Toaster of a Generation: After Dark's Flying Toasters have been emulated, assassinated and morphed by competitors in the lucrative screensaver industry

It seems apt that the future of TV is finding its feet in Marshall McLuhan's home town of Toronto where Citytv is proving that the medium is the message.

life to air

BY TIM THWAITES

You've just returned from two weeks holiday in the wilds and the only things you really missed were the fortunes of your football team. All it takes is a phone call to the local television station, a few seconds work at the keyboard of your personal computer, and all news items relating to your team for the past fortnight can be downloaded onto a CD-ROM for home-viewing.

The agreements to put such a system into place are being negotiated between American companies specialising in multimedia technology and Citytv in Toronto, Canada. The systems should be up and running next year. It is no surprise that Citytv should be involved in constructing this section of the infobahn. Not only has this independent Toronto television station been at the forefront of innovation for more than 20 years, but it has also spent that time refining a style of television which interacts with its audience – and interaction is what the infobahn is all about.

For Citytv is a television station like no other – a complete contrast to the gilded dream-factories of national and global network television. Far from keeping its audience at arm's length while creating a fantasy world for them, Citytv and its companions, the Canadian music video network MuchMusic and its French-language counterpart MusiquePlus, do the opposite. They constantly invite viewers to confront television as part of their daily lives, to watch it being made and become part of it.

Citytv has managed to carve out a solid niche for itself in Southern Ontario, the fourth largest television market in North America and one of the most competitive in the world. Toronto has nine local television stations and another 50 alternatives on cable to which 95 per cent of viewers are connected. Yet Citytv consistently rates in the top three stations watched, attracting about one viewer in eight.

And it does so while breaking many of the cardinal rules of conventional television. For instance, it broadcasts no first-run U.S. network shows, a fact of which Jay Switzer, the vice-president in charge of programming, is very proud. It depends on more than 60 per cent local content in daytime and prime time, he says.

Citytv does not, like the networks, try to provide something for everyone, Switzer says. "We don't care if half our potential audience hates our guts."

Switzer is speaking from a position of strength.

While he will not give exact figures, media commentators estimate present profit levels of Citytv and the two music video networks at about $100 million a year. That is not bad for an enterprise which started 22 years ago with an investment of about $2 million.

Housed in an impressive 'industrial gothic' building in one of the more colourful parts of Toronto's polyglot downtown area. Citytv has become a focus of city life. Inside, the whole complex is wired and designed so that, within a matter of minutes, any part of it can be used as a set – from the chairman's office to the foyer and the surrounding streets. Video equipment is strewn everywhere. People can gaze in on this studio-less environment through large tinted picture-windows. They watch the process of making television. In summer the windows can be opened to bring in the street. But year round there is an opportunity to become part of the audience inside. And if you work at Citytv or MuchMusic, you are automatically a part of the set.

"The building that shoots itself," is what Citytv president, executive producer and artistic guide Moses Znaimer calls his headquarters. Even when Znaimer's slight figure is not in evidence at Citytv, his presence – in the form of printed aphorisms – is everywhere.

He believes that the future of television is not in networks but in localism – "television with a sense of the street". His broadcast centre without studios helps to create this impression by taking television "from a flat two-dimensional picture into a highly textured environment with all the layers of real life".

"Television is not about show, but about flow"

His sayings roll on. "Television is not about show, but about flow – the real television station is revealed between the programs. Citytv is a process: a perpetually unfolding story, in real time, that is as much the story of the people telling it as it is about the world 'out there'." Citytv is Marshall McLuhan come alive in the city in which McLuhan lived – the medium is the message.

Putting all this into practice has meant much more than a studio-less television centre. And while not all the innovations employed are Citytv's own, the format and the way they are used certainly are. Citytv focuses on news, movies and music. You won't find any sitcoms,

"We've just seen the future of TV. And we're totally unnerved."

serials, game shows or live sport. What you get is newscasts, talk shows, digests of fashion, style, dance and music, and movies of every genre. Citytv shows first run movies and invests in between 10 and 12 local productions each year.

To bring the sense of the street into the living room, Citytv has tapped into the remote control cameras of the city traffic and public transport authorities. It runs its own fleet of more than 20 mobile news-gathering trucks, staffed by videographers – cameramen and women who film, write, report and edit their own stories, using electronic news gathering technology to the full.

News broadcasts feature anchorpersons who move around a live working newsroom, broadcasts crammed with live crosses, issues upon which the viewers can vote and the opinions of people on the street. Most of these techniques have been pioneered at Citytv in the past 20 years.

At the corner of the broadcast centre itself is a booth that has become a symbol of everything for which Znaimer stands – *Speaker's Corner*. There, for the princely sum of $1 (which goes to charity), anyone can walk off the street and record a two-minute tape on any subject about which they feel strongly. The tapes are reviewed, and the best are aired on the news, as fillers, or in a weekly compilation. Two examples probably illustrate better than anything else what Citytv is about.

After thousands of football fans saw a local football hero deliberately stomp on an opponent's head, he went for confession and absolution to *Speaker's Corner*. He asked for forgiveness on Citytv.

Having finished a tour of Citytv, three American network television executives piled into the booth to record their observations. What started as a joke became a telling comment.

"We've just seen the future of TV," said one. "And we're totally unnerved." You could see in his eyes that he was telling the truth.

But none of this would work unless it made economic sense, and it does. First, once the technology is in place, this sort of television is cheap to make. One estimate of the cost of Citytv's top-rating news is between $5,000 and $10,000 an hour, peanuts compared with the slick network newscasts. Second, what Znaimer is creating with his Living Movie – a term he has registered as a trade mark – is loyalty to a TV station rather than the TV program. People tend to watch Citytv for a certain style of television as opposed to particular programs. Third, programs made for the local Toronto market have proved to be winners worldwide. Citytv and MuchMusic digest programs are now seen in more than 100 countries. Even in Australia – which has proved one of the hardest markets to crack – the fashion show, *Ooh La La!*, is now running on the multicultural network, SBS. Given that the shows are made for a local audience, and must be paid for out of local revenues, anything sold elsewhere is pure profit.

The Citytv style is beginning to catch on in other places and other fields of interest. Already, the music-video format has been exported to Argentina, where MuchaMusica is on air in Buenos Aires. Interest has been expressed in Britain, Ireland, Spain, Germany and France.

The Canadian Radio-Television Commission has recently awarded the Citytv group a licence for a new national performing-arts channel on cable. Some arts organisations are so appalled that street television should be given this opportunity, they have appealed to federal Cabinet to overrule its broadcasting regulator and stop Citytv from selling the arts.

But even Toronto's establishment broadsheet, *The Globe and Mail*, has found the highbrow sensibilities of these representatives of the arts community too much to bear, and loudly said so in an editorial broadside. The new channel, Bravo!, is set to start in January.

But where will this expansion of the Znaimer format lead? Can localism be patented and franchised without destroying its spirit? Already, while an ever-growing throng of people tour Citytv daily, Znaimer has become increasingly wary of showing executives from rival organisations what he is doing. Will the Citytv format work outside Toronto? The free-wheeling cosmopolitan society of Toronto gives Citytv a particular vitality that may not be easy to reproduce in some of the more hidebound cities of the Old World.

And how much does localism in television depend for its success on the presence of healthy global networks with which to contrast? Stay tuned to Citytv for further developments in Moses Znaimer's "perpetually unfolding story". ■

WITH THE INTRODUCTION OF TRADITIONAL TECHNIQUES FROM CHINA, WESTERN MEDICINE MAY BE FACING A REVOLUTION THAT IS THOUSANDS OF YEARS OLD.

harmonious revolution

BY TANIA EWING

Two of China's most revered exponents of traditional medicine sit sipping chrysanthemum tea. They confer with each other in the rapid staccato that, to a foreigner, sounds like hailstones on a tin roof. As they debate beneath exquisite silk paintings of some of China's ancient healers, it becomes clear, through an interpreter, that they are discussing the latest treatment of a patient using a mixture of herbs.

The surprising element about their conversation is not the talk of medicinal plants, but the descriptions of recent genetic analyses, the latest hi-tech therapies and the use of expensive diagnostic machines that this treatment has also involved – close your eyes and you could be listening to doctors in New York, London or Melbourne.

In China there is an increasing trend to integrate traditional Chinese medicine (TCM) with modern Western medicine. As much as people in the West are turning towards acupuncture and Chinese herbs, so the Chinese are increasingly adopting chemotherapy for cancer, and genetic engineering techniques for the prevention of disease.

Traditional Chinese medicine dates back more than 3,000 years with the first classical work on healing, *Han Di Nei Jing*. Instead of looking at the human body as a structure, built of bones, muscles, organs and skin, the Chinese doctor sees the body as a complex, yet harmonious, system of cycles, polarities and energy fields.

Traditional Chinese healers contend that every person exists in a state of harmony – if this balance is broken then something is wrong. "The holistic approach has the advantage of taking into account the whole person, not just isolated body parts and symptoms," writes Dr Zhong-pu in the *International Journal of Oriental Medicine*. TCM relies on the mobilisation of a person's natural resistance to disease: any imbalance within the body may be restored to a healthy state of balance through herbal medications and/or acupuncture.

In the last 40 years there have been more than 110,000 Western doctors trained in integrated TCM/Western medicine programs in the People's Republic of China. It is these doctors, who trained in the 1950s and '60s, who are now professors and senior physicians – the healers who are attempting to merge the rigours of Western medicine with TCM.

Zhong-pu is aware of the limitations of TCM which, he says, "lacks precision and correctness", the hallmarks of Western therapies.

However, the two cultures can work synergistically, he says: "The precision of Western medicine compensates for TCM's shortcomings by employing both the holism of TCM and the precision of Western medicine, a more accurate diagnosis can be obtained than would be possible if only one system's diagnostic methods were utilised."

Western medicine, Zhong-pu says, "though highly proficient... tends to neglect the patient's overall condition". In addition, while Chinese medicines are rarely toxic and have few side effects, Western medicines "at therapeutic doses are somewhat toxic to both pathology and the patient. Side effects are the rule rather than the exception."

Despite its history, Chinese medicine has long been considered flaky and 'alternative' by most Western practitioners. However TCM is gaining acceptance in the West, and, in many ways, this acceptance arises because TCM practitioners are adopting some of the West's ways.

In the early 1990s the World Health Organisation (WHO) in Geneva tested an ancient Chinese herb which was found to be three times as effective as quinine in preventing deaths from drug-resistant malaria – a disease that strikes up to 500 million people a year, killing between 1.5 and 3 million annually.

Balancing Act: Traditional Chinese medicine is gaining acceptance in the West because practitioners are adopting many of the West's ways.

Dr Daniel Weber, director of the Green Medicine Company, has been practising TCM since he arrived in Australia from the United States in the 1970s. He sees it as inevitable that bodies like WHO are becoming interested in traditional therapies.

Weber says that his interest in Chinese herbal treatments in Australia has escalated to the point where almost half of the patients attending Chinese medical clinics are from non-Asian backgrounds. He stresses that herbal medicines should be seen as an addition, rather than an alternative, to Western medicines which he says are still "the best acute medicine".

In 1992 Weber developed the world's first computer data-base to assist general practitioners specialising in TCM to access, diagnose and treat patients. The data-base describes more than 390 medical symptoms, differentiated by 1,100 separate patterns and includes 257 medical formulas and 378 medicinal herbs. The package, targeted at the lucrative U.S. market where alternative treatments are increasing in popularity, is supported by a complete guide to TCM with an index – the medical formulae are printed in English, Latin and Chinese.

This year the Royal Melbourne Institute of Technology (RMIT) introduced a three-year post-graduate Chinese medicine course, believed to be the first in the Western world. The Master of Applied Science (Chinese medicine) is taught through RMIT's Biomedical and Health Science Faculty. Professor Andy Kleynhans, associate dean of the faculty, believes that Australia is ready for the graduates that this course will produce. "I think we now have a community that wants a greater range of options in health care. I see a time when, ultimately, Chinese medicine is integrated with Western medicine. In China patients have a tremendous choice – Western and Chinese medicine available in the same hospital," he says.

"Of course there are suspicions about Chinese medicine, but there are always suspicions about anything 'new'."

Diplomatic Immunity: China is trialling traditional medicine in Tanzania, a country where AIDS is in epidemic proportions.

Dr Ben Chen, the head of RMIT's Chinese Medicine Unit, graduated in Chinese medicine 26 years ago, and subsequently qualified as a Master of Western medicine in China. He has also completed a Doctorate of Medicine at the University of Melbourne. He estimates that there are at least 2,000 TCM practitioners in Australia – many with qualifications at accredited universities in the People's Republic of China.

However, the inclusion of Chinese medical practitioners into our medical system has its opponents. In 1992 the Australian Medical Association (AMA) urged police to charge a Melbourne Chinese woman practising TCM, because she called herself a doctor.

Mrs Liu Dan, a doctor of medicine in China, said the AMA's real intention was to stop Chinese traditional medicine being practised in Australia. The charges were dismissed by the court.

If Chinese medicine is to gain acceptance by doctors and scientists in the West, then the area that is likely to contribute most to its acceptance is AIDS research.

The world's AIDS-research community has all but given up hope of a cure – the aim, now, is to prevent the progression of illness and keep HIV-infected people well. Having poured billions of dollars into the development of Western therapies, researchers are now looking to the East.

Professor Lu Weibo is the director of the AIDS research department of the Chinese Academy of TCM in Beijing. It is forbidden by the Chinese government to publicly estimate the number of HIV-infected individuals in China, however Lu believes that the figure is probably close to 10,000. Others, outside China, put the figure closer to 50,000. In a country of 1.2 billion people, China can barely be said to be part of the AIDS pandemic. "It is really only this year that China has started to take AIDS and HIV seriously. The problem in surrounding countries is exploding and it must cross our borders soon," Lu says.

"We need to catch up with AIDS education and surveillance, blood screening, condom distribution and the prohibition of prostitution."

The government has formed the Chinese Association of Sexually Transmitted Diseases and AIDS and has set up experimental testing sites in Shanghai's blood banks – a city with more than 3,000,000 blood donors. This sentinal testing, as it is called, is likely to give the government their first real idea of the spread of HIV in their country.

The main focus of China's HIV problem lies on the border of Myanmar (formerly Burma) and the Golden Triangle in Yunnan Province. In a country where homosexuality is forbidden, intravenous drug use and prostitution are the main means of virus transmission.

According to Lu's colleague, Professor Boping Wu, from the Traditional Medicine Collaboration Centre in Beijing, the advantage of using traditional medicines to treat HIV infections is "they are very cheap and have few side effects".

Traditional medicines, such as licorice, are used to either stimulate the patient's immune system – fighting off the infections such as pneumonia which are characteristic of AIDS – or inhibit the spread of the virus.

According to Lu the Chinese government is conducting clinical trials of licorice in Tanzania, a country where AIDS is in epidemic proportions. The first trial tested licorice, as well as other traditional herbs, in 158 patients with AIDS and HIV infection. In what he calls a "miracle", three of these HIV-positive patients have become HIV-negative. "They appear to have cleared the virus from their systems," he says.

Aware that such claims will be met with scepticism in the West, Lu has made sure that all three patients were clinically evaluated using Western techniques such as polymerase chain reaction (PCR), a technique that amplifies any minute amount of HIV genetic material that may be present in the patient's blood.

Dr Nick Crofts, director of epidemiology at the MacFarlane Burnett Centre for Medical Research in Melbourne, has recently returned from Yunnan Province. He has talked to the doctors who claim to have rid previously HIV-positive patients of the virus. "Often you have to wonder whether these people were actually HIV-positive to begin with, whether the first diagnosis was correct – in many ways these trials have a long way to go before they will be accepted in the West," he says.

In an article published in a Chinese scientific journal the patients' improvements are described as "deserving of further investigation. TCM may be a potential treasure house as an anti-AIDS treatment".

Despite his scepticism, Crofts is still unwilling to totally dismiss TCM and admits that "further investigation should probably be pursued".

Boping Wu is aware of how the West sees TCM. Because of this, and his strong belief in the powers of both Western and ancient Chinese medicines, he is keen to introduce many Western forms of treatment into China. "Within the academy we have two hospitals – in one we use Western medicine to treat acute illnesses such as vascular disease and tumours," he says.

The hospital is equipped with expensive hi-tech equipment such as CT scanners which can detect the shadows that can indicate the presence of cancer.

Boping Wu won't be drawn on which treatment most Chinese prefer, saying only that "it depends on the disease – acute, infectious diseases generally are treated with Western medicines because they have a faster effect".

"For chronic diseases such as slow-growing tumours and diabetes we use TCM – in China the patient can choose."

In the West, normally pragmatic and sceptical scientists are also investigating traditional Chinese medicines. In what must be seen as the ultimate acceptance by Western medicine, traditional Chinese medicines have been tested at the prestigious and conservative Harvard Medical School. It was there that scientists recently used hamsters' love of alcohol to show that a herb used in China for 1,300 years can stem a big thirst. Researchers in Boston used Syrian Golden hamsters, which drink alcohol in preference to water every time, to prove that the herb can cut alcohol consumption by half. The herb, derived from the root of the kudzu vine, has been used traditionally in China to treat alcohol abuse.

The U.S. scientists found that two active ingredients, diadzin and daidzein, reduced alcohol consumption in hamsters. Further tests are being conducted and clinical trials of these ingredients, with humans, are planned.

When asked what he thinks of the Harvard clinical trial Lu simply laughs. "You know, we don't need to be told that TCM works – we have known this for thousands of years." ■

HealthNet Australia

HealthNet Australia (HNA) is an innovative way of managing and disseminating health related information. Pioneered by staff at Fairfield Hospital, Victoria, the electronic CD ROM library and file system has taken a different approach to offering its services, by using TELECOM's new 190 "Infocall" service. Subscribers can dial the 190 number using their PC and modem, and gain access to HNA for a flat cost per minute fee, which includes their call from anywhere in Australia and the on-line service charge. The rate of 75 cents per minute nationally or 50 cents per minute for metropolitan Melbourne is cost effective and will ensure a stable subscriber base.

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HNA uses state of the art hypertext software to ensure speed and ease of use for callers browsing files on the system.

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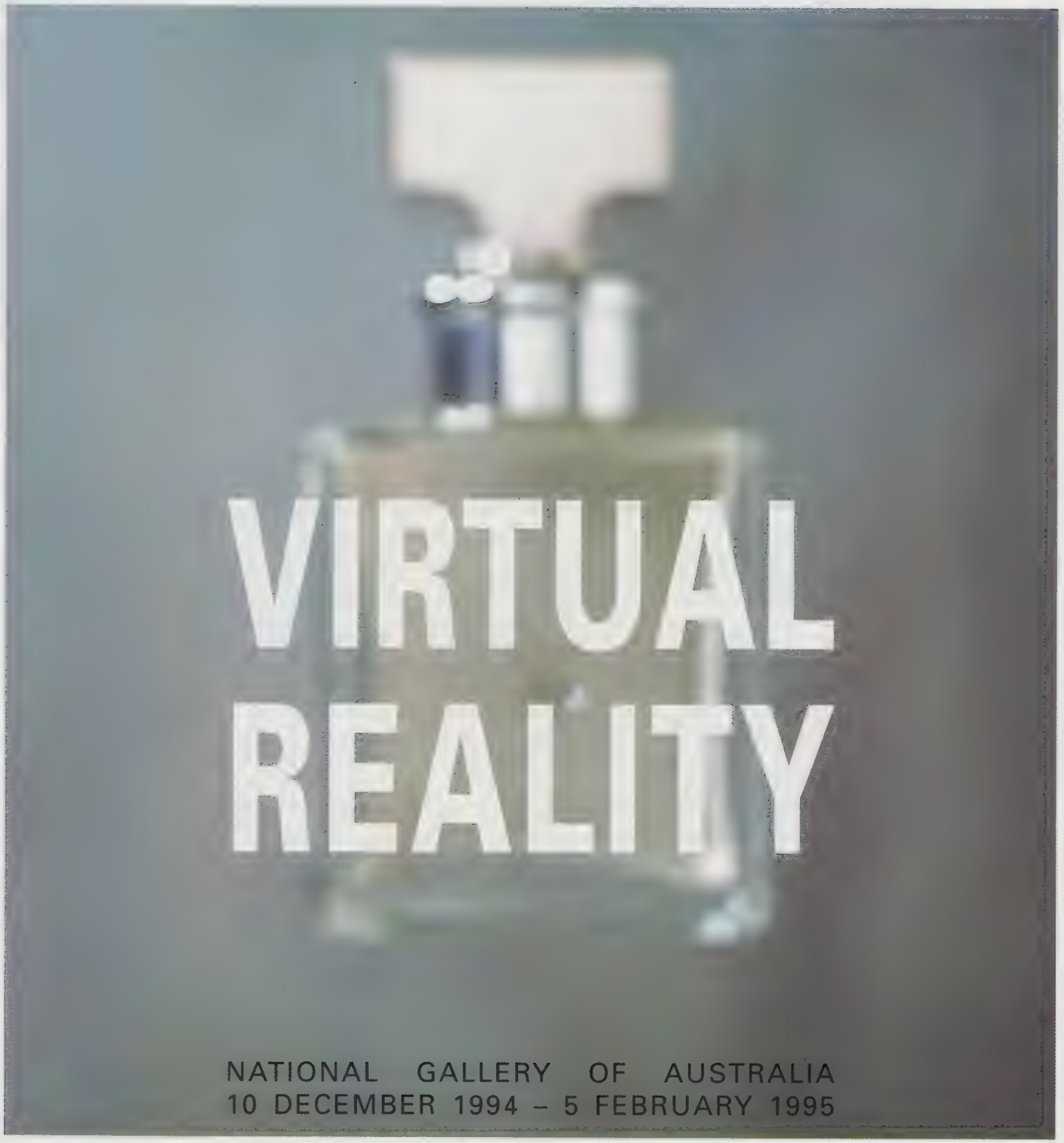
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YOU DON'T NEED A TARDIS TO TRAVEL IN TIME, JUST THE COLLAPSED HEART OF A MASSIVE STAR, AN AIRLINE TICKET...AND MAYBE A BIT OF CHICKEN WIRE.

twists in time

by Paul Davies

Image by Christopher Waller/John Webb

IT'S NOT EVERY DAY THAT A GRADUATE STUDENT STUMBLES ACROSS A BIZARRE COSMIC OBJECT THAT MIGHT HAVE LEAPT STRAIGHT FROM THE PAGES OF A SCIENCE FICTION NOVEL. BUT THAT IS EXACTLY WHAT HAPPENED IN 1967 WHEN JOCELYN BELL OF CAMBRIDGE UNIVERSITY BECAME THE FIRST HUMAN BEING TO DETECT THE DISTINCTIVE 'BLIP, BLIP, BLIP' OF A PULSAR. USING LITTLE MORE THAN CHICKEN WIRE STRUNG OUT IN A SOGGY CAMBRIDGESHIRE FIELD TO FORM A LOW-COST RADIO TELESCOPE, SHE ACHIEVED HER GOAL – AND SCIENCE HAS NEVER BEEN THE SAME SINCE.

Within months of her world-famous find, it became clear that Bell had discovered a class of dead stars that are so compact they can slow the passage of time by up to 30 per cent. Known as neutron stars, their intense gravity warps both space and time in a spectacular manner. A neutron star is the collapsed remnant of an ordinary star, and as it spins frenetically in space, it can generate incredibly regular radio bleeps. It is these bleeps that led to the name 'pulsar'.

Although really large timewarps have been discovered only comparatively recently, the idea that time can be distorted dates back to 1905 and the appearance of Albert Einstein's theory of relativity. Before Einstein, everybody thought that time was simply there – absolute and universal. It was an assumption that had gone unchallenged since the time of Isaac Newton. However, on the basis of mathematical reasoning, Einstein predicted that if a clock were to approach the speed of light, it should appear to an observer at rest to run slow. Moreover, the effect is such that the closer the clock gets to the light barrier, the slower it runs, so that at the speed of light the clock would appear to have stopped altogether.

For this reason the clock – or anything else for that matter – cannot break the light barrier. The 'time dilation effect', as it is called, is not restricted to clocks; it affects all physical processes equally. A person's ageing or the rate of decay of a radioactive substance, for example, would be stretched by exactly the same factor. For this reason, it is more accurate to think of the distortion as that of time itself, rather than as some sort of obscure disturbance to the internal processes of the speeding clock.

Light travels at 300,000 km per second, so the time dilation effect is hard to test practically. In fact, it was not until the detailed study of cosmic rays in the 1940s that Einstein's prediction could be experimentally checked. Cosmic rays are highly energetic particles that arrive from space moving very close to the speed of light. When they enter Earth's upper atmosphere, they collide with atomic nuclei in the air and create showers of subatomic debris. Abundant among this detritus are unstable particles called muons.

At rest, a muon usually lives for about two microseconds before decaying into an electron – yet cosmic ray muons are readily detected at sea level. The explanation? Time dilation: at the speed of light, a particle could travel, at most, 600 metres in two microseconds, and the muons' enormous speed effectively stretches their lifetimes – as observed from our frame of reference – enabling them to survive all the way down to the Earth's surface.

In recent years, particle accelerators have been used to create and study high-speed muons to test the theory of relativity in the laboratory. By carefully measuring both the speed and the decay rate of the particles, physicists have been able to confirm Einstein's time dilation formula with high precision. In one experiment performed at CERN, Europe's showpiece high energy particle physics laboratory, accelerated

muons circulating in a ring-shaped vacuum tube were observed to live an average of 29 times longer than at rest.

Impressive by Earth-bound standards, but pretty small beer compared to the kind of time dilation effects attained in space. Last year, a research group in Arizona detected a cosmic particle that struck the atmosphere, moving so close to the speed of light that its timewarp factor was a staggering one hundred billion. If a clock was moving alongside it, the clock would appear to us to run so slowly that several thousand Earth years would elapse between each tick. Now, *that's* time dilation.

It's possible to demonstrate time dilation directly, using sensitive atomic clocks. In October 1971 the U.S. Naval Observatory sponsored round-the-world trips via jetliner for several such devices. Because aircraft travel at less than one-millionth of the speed of light, the time dilation involved is minuscule but within the measuring capability of super-accurate atomic chronometers. On the eastward journey, the clocks came back an average of 59 nanoseconds – that's billionths of a second – slower relative to standard atomic clocks kept at the observatory. On the westward journey, the clocks were on average 273 nanoseconds faster. The reason for the east-west difference is because, as Einstein noted in his original paper, the Earth's rotation produces a time dilation too. When the effect of the Earth's rotation was removed, the time dilation produced by the airliners' motion elegantly confirmed Einstein's formula.

The warping of time by motion is now so well established that engineers routinely take it into account when designing particle accelerators and even radar equipment. In fact, the effect is exploited for commercial purposes in machines called synchrotrons. Invented by Australian Sir Mark Oliphant in the 1940s, synchrotrons were originally intended as particle accelerators for investigating the sub-atomic world by whirling electrons around a circular track at close to the speed of light. As they circulate, these charged particles spew forth intense electromagnetic radiation – the same mechanism, it turns out, as pulsars use to produce their radio blips. Today this 'synchrotron radiation' is exploited as a handy source of X-rays and ultraviolet light. It is employed in drug design and microlithography, and in the study of the molecular structure of plastics, glasses, ceramics and even viruses.

Synchrotron radiation, it should be noted, would be useless for these purposes were it not for time dilation. The synchrotron at Daresbury in Britain, for example, is 96 metres in circumference, and the electrons complete three circuits every microsecond, or rather every microsecond as measured in the laboratory. This corresponds to the radio region of the electromagnetic spectrum – far too low a frequency to study microstructures. But in the reference frame of the circulating electrons, the journey is completed much faster owing to time dilation, and it is radiation at this higher frequency which is emitted. Boosted in frequency a trillion times by relativistic timewarping, the emerging radiation has immense commercial value – companies are willing to pay several thousand dollars a day for the use of a synchrotron radiation source, proving that time is money.

The time dilation effect has some profound philosophical implications too. Imagine a pair of identical twins, Ann and Betty. Suppose Ann goes off to a nearby star in a spaceship at close to the speed of light, while Betty stays at home on Earth. The ship returns 10 Earth-years later, and Betty finds to her consternation and envy that Ann has aged just five years to her 10. This state of affairs could be accomplished if Ann travelled at 87 per cent of the speed of light. Aboard the speeding ship, just one year of time elapses for every two on Earth; effectively, Ann is using the spaceship to time-travel into Betty's future. By going faster still, Ann could theoretically return home hundreds or even thousands of Earth-years later. She would have aged only a few years herself, but returns to find not only her sister dead, but all human civilisation long since vanished in the mists of time.

It is important to realise that Ann would notice nothing unusual about the passage of time as she zoomed across the galaxy. In her frame of reference, time passes perfectly normally. It is only when the twins get together again to compare experiences that the temporal dislocation is revealed. As far as Ann is concerned, only five years have elapsed since she embarked on her journey. Thus Ann cannot use the trip to live longer, or slow her ageing, as judged in her own frame of reference.

The twins example graphically illustrates that time is not absolute and universal, but totally relative. My time and your time can get out of step if we move at different speeds. There is no such thing as 'the time'. In particular, there is no universal 'now' or present moment throughout the universe that all observers can agree on. When Betty wonders, one Earth-year after the spaceship has departed, what her astronaut sister is doing 'now', her definition of the events in the spacecraft occurring at that time is completely different from Ann's.

Physicists have concluded that because time is relative, it cannot be meaningfully divided into past, present and future. Instead, all of time must in some sense exist 'at once', just like space. Indeed, time is usually treated by physicists as a fourth dimension, to go alongside the three spatial dimensions. This suggests that time is really stretched out to form a sort of 'timescape', and the concepts of past, present and future are merely psychological constructs for the benefit of humans.

Shortly after Einstein published his theory of relativity, he realised that motion was not the only cause of timewarps. Gravity can also distort time. The Earth's gravity, for example, slows time at its surface by a tiny but measurable amount. In 1976, the American physicist Robert Vessot sent an atomic clock into space aboard the nose-cone of a Scout D rocket. A slight time discrepancy between the rocket clock and a similar clock on the ground was detected, directly proving that time really does run a bit faster in space than down on the ground.

The time dilation effect has some profound philosophical implications too...there is no such thing as 'the time'. In particular, there is no universal 'now' or present moment throughout the universe that all observers can agree on.

In the brief duration that Ann took to drop across the critical radius, all of eternity would have passed by in the universe outside. By crossing into the black hole, Ann will have effectively gone beyond the end of time.

The Earth's timewarp is imperceptible in daily life. Even at the top of a mountain, the temporal discrepancy amounts to no more than a few nanoseconds per hour. The Sun's gravity is much larger however, and its timewarp effect has been revealed by a clever technique known as radar ranging. Radar pulses can be bounced off Venus and Mars, and their echoes carefully timed to measure the distances to these planets. When the planets lie close to the Sun, and are located on the far side, the radar waves have to pass close to the solar surface on both the outward and return trips. It's been found that the signals get back to Earth as much as several hundred microseconds late. The delay arises because the signals spend some minutes passing through the large gravitational field close to the sun, where time runs at 99.999 per cent of the rate on Earth.

The communications equipment aboard the two Viking spacecraft, which the U.S. space agency NASA landed on Mars in the late 1970's, have enabled scientists to measure the signal delay to the spacecraft with high accuracy. Again the Sun's timewarp was manifested as Mars crossed the region of the sky near the Sun. Einstein's formula for the gravitational timewarp, which he worked out as early as 1907, was again confirmed.

To observe a really big gravitational timewarp, you have to look beyond the solar system altogether. The stronger the surface gravity of an object – a star, planet or other cosmic body – the more that time becomes distorted. The strength of an object's gravitational field depends both on the amount of matter it contains, and its size. The more a body is compressed, the stronger the gravity gets at the surface. If the Sun were shrunk to the size of a planet, its surface gravitational field would rise a hundred-fold. Stars known as white dwarfs have masses comparable to the Sun, but are as compact as Earth, and their timewarps are readily spotted in the spectra of their light. As the lightwaves climb away from the surface of the white dwarf, their frequency is reduced. Because low frequencies are associated with the red end of the visual spectrum, astronomers call this effect the 'red shift'.

More dramatically, if a star with the mass of the Sun is compressed to the size of a city – as in the case of a neutron star – then time can be very significantly warped. Indeed, there is no limit to the magnitude of a timewarp as a star shrinks in size, although there are fundamental physical reasons why a star cannot remain stable if it becomes too compressed. A critical stage is reached where the star's gravitational field becomes so enormous that it overwhelms the internal pressure, and the body then collapses catastrophically. When this happens, the stage is set for the most awesome timewarp in the universe.

A typical collapsing star will shrink appreciably in a microsecond. Its timewarp will soar as it contracts. According to Einstein's formula, the timewarp factor climbs inexorably towards infinity as the radius of the star approaches about three kilometres. This is known as the star's Schwarzschild radius, after the German astronomer Karl Schwarzschild who discovered it in 1916. From the viewpoint of the imploding matter, the surface of the star retreats across the Schwarzschild radius in the twinkling of an eye, and the star reaches zero size an instant or so later. Viewed from afar, though, the picture is very different.

Time becomes so warped by the star's escalating gravity that the pace of events on the star as observed in the Earth's reference frame is drastically slowed. If we could follow the fate of a collapsing star as it approached the critical Schwarzschild radius, we would see all physical processes there, including the collapse itself, frozen to a standstill. The infinite timewarp means that, to us, the star's time has stopped. As a result, we would never witness the star plunging inside the critical radius to vanish at a single point.

In practice we wouldn't see the surface of the star frozen in space in this weird manner. The same timewarp that slows the motion of the star also slows the frequency of the light whereby we can see its surface. Just as the light from a white dwarf appears slightly red-shifted, so the light from a totally collapsing star is hugely shifted – shifted, in fact, right beyond the visible portion of the spectrum. As a consequence the star literally drops out of sight. All that remains is a black hole – a dark region of space which the star once occupied.

Black holes are infinite timewarps, regions of space where time stands still relative to Earth time. An intrepid Ann, not content to simply fly to a star and back, but who has a close encounter with a black hole on the way, could increase her time shift even more. Spending a week hovering 10 metres above a black hole would add a couple of Earth years to the duration of her journey.

If Ann chooses to perform this manoeuvre, she needs to take extreme care not to cross into the Schwarzschild radius. Although she would not herself experience anything unusual about the passage of time if she did cross it, the infinite timewarp at the surface of the hole implies that, in the brief duration that Ann took to drop across the critical radius, all of eternity would have passed by in the universe outside. By crossing into the black hole, Ann will have effectively gone beyond the end of time as far as the rest of the universe is concerned. It is for this reason that nothing that enters a black hole can ever come back out again. Nothing can return from beyond the end of time.

Although the adventures of Ann and Betty belong to the realms of science fiction, the laws of physics that they illustrate are real enough. Black holes and neutron stars – not to mention cosmic rays – are part of the 20th century astronomer's universe, and the timewarps they represent produce observable effects. In daily life we may get by with Newton's comforting concept of universal and absolute time, but the warped time of Einstein is the bizarre reality.

So when you next take a trip on an airliner, remember that you are travelling, not just through the air, but through time as well. ■

COMBINING THE SCIENCE FICTON OF 'STAR TREK' AND EINSTEIN'S THEORY OF RELATIVITY, SCIENTISTS ARE SERIOUSLY CONTEMPLATING AGELESS TIME TRAVEL AT WARP SPEED.

WARP SPEED

By Julian Brown

I ALWAYS DID THINK THE SCIENCE IN 'STAR TREK' A BIT FLAKY. FOR A START, THERE WERE THOSE TELEPORTERS WHICH CAPTAIN KIRK AND HIS CREW USED TO BEAM FROM THE ORBITING STARSHIP 'ENTERPRISE' ONTO THE SURFACE OF A TROUBLED PLANET IN THE BLINK OF AN EYE – HOW CONVENIENT NOT TO GO THROUGH ALL THE HASSLE OF GRAVITATIONAL RE-ENTRY AND TAKE-OFF. BUT THINK OF THE DIFFICULTY OF THIS SIMPLE ACT!

To zap a human body, turning matter instantly into energy, transmit it through space and through a disrupting blanket of atmosphere, and then rebuild the body, atom by atom, as the energy is re-converted into matter. And exactly as it was before – one head, two arms and no disfiguring computational errors. Sometimes however, these details get the attention they deserve, as in David Cronenberg's thriller *The Fly*, which demonstrated how matter transference could go horribly wrong if a human and a fly were in the same teleporter pod together and the computer was left to figure out how to put the two back together at the other end.

But even allowing a little artistic licence, *Star Trek* surely committed an unforgivable heresy by suggesting that one day we'll be able to cruise the universe at speeds faster than light, right? Didn't Albert Einstein himself show it was impossible to exceed the speed of light? Strangely enough, this is one area where the creators of *Star Trek* may have got it right. According to research in the United Kingdom, there may well be a way of breaking the light barrier.

Dr Miguel Alcubierre of the University of Wales in Cardiff was applying his brainpower to the equations that govern the nature of space and time, and asked himself whether there might be a way to use them to beat light at its own game. What he came up with surprised even him, and he promptly published it in the high-brow physics journal *Classical and Quantum Gravity*

One technicality: **just how do you compress space-time and expand it again?**

To understand Alcubierre's idea, we need to look first at what Einstein really said about space travel. Take a journey to Alpha Centauri; at around 4.3 light years distance, it is the nearest star to the Earth (other than the Sun, of course). Travelling at close to the speed of light – currently beyond our technical know-how – the journey would take around eight years. For more distant objects like other galaxies, the journey times would stretch into millions, even billions, of years.

But these journey times are measured by people left behind on Earth. According to Einstein's special theory of relativity, time passes more slowly on the spaceship if it is travelling at close to the speed of light. Theoretically space travellers could journey a million light years in a week or even a day, depending on how close to light speed they were. So, if we can travel very close to the speed of light, we can travel virtually anywhere in the universe in virtually no time at all – just like the E*nterprise*, right? So what's the problem?

The big drawback is that while you were streaking through space, you would age much more slowly than people on Earth. If you went on a journey to another galaxy, by the time you returned, all of your friends and family would have long ago been fossilised, even though you might have aged only a few years. This is an example of the so-called twin paradox, whereby someone who went on a space journey at near light speed could return to find his twin brother or sister many years older, or long dead.

This is a serious disincentive to long distance space travel. If you want to travel a million light years from Earth there is no escaping the fact that people on Earth will age at least two million years before you return. Unless, as Alcubierre wondered, there is a way of travelling faster than light. If so, then this would open up the rest of the universe for exploration without having to say goodbye to loved ones on Earth forever. But how can it be done?

On the face of it, the task appears a tough call. According to Einstein's special theory of relativity, as a spaceship approaches the speed of light, it becomes heavier. To actually reach the speed of light you would need an infinite amount of energy (impossible) and, at light speed itself, the spaceship would acquire infinite mass (also impossible).

If you could somehow jump the light barrier and travel faster than light, a strange thing would happen. The value of your mass would become an imaginary number – a multiple of *i*, the square root of minus 1. Just what an imaginary mass would be like is hard to say – it certainly would be very different from conventional mass. You would find time travelling backwards. Altogether, a very unusual experience.

Alcubierre thought there ought to be a way of avoiding such unwelcome side-effects to overtaking light speed. So, instead of relying on the special theory of relativity, he turned to Einstein's general theory. The difference between them is that the general theory takes into account the effect of gravity, the dominant force on astronomical scales.

Gravity is a remarkable force in that it is able to change the geometry of space and time. When light from a distant star skirts by our Sun, for example, the beam is slightly bent by the gravitational distortion in space-time created by the "weight" of the sun. By gathering enough matter in once place, it would be possible to warp space-time like an iron ball would distort a rubber sheet. Such warped space-time can not only curve the path of a moving object like a light beam, it can also shrink the distance between two points.

Although one could imagine shrinking the space-time between astronomical objects to lessen the distance between them, it seems hard to think of how you could do it in practice. However, Alcubierre found that if there were some way of compressing space-time just ahead of a spaceship and then expanding it again just afterwards, you could achieve a similar effect.

"My method does not violate Einstein's special theory of relativity which says that nothing can exceed the speed of light. Instead it involves warping the space in front so that distance is eliminated and the onward journey becomes instantaneous," Alcubierre explains.

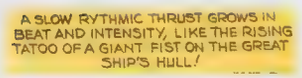
Amazingly, Alcubierre's calculations show that his method could reduce the travel time of any journey to as small a figure as desired – and that this time would be the same to the travellers aboard the spaceship as that experienced by their family and friends left behind. With this, rapid interstellar travel becomes a possibility.

One technicality: just how do you compress space-time and expand it again? According to Einstein's general theory, compression is no real problem – you just need a very heavy lump of matter to warp the space-time in front of you. In practice, you would need something extraordinarily heavy to do this – perhaps even a black hole. This is quite tricky, since collapsed stars are hard to come by near Earth and how you would lug this lump of super-dense matter around is anybody's guess.

Setting the structure of the universe back to normal by expanding the space behind the spaceship requires even more resourcefulness. To make space-time expand you need something that, in effect, behaves like an anti-gravity force. No known material produces such a force.

But Alcubierre realised that according to modern theories of the Big Bang, the expansion of the universe was actually

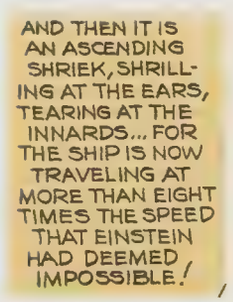
According to Einstein's general theory, compression is no real problem –



you just need a very heavy lump of matter to warp the space-time in front of you.

fuelled by "exotic matter" that produced a repulsive gravitational force. If some way could be found to generate this exotic matter now, then we would have the raw materials to test out Alcubierre's idea. As he says, "A propulsion mechanism based upon such a local distortion of space-time just begs to be given the familiar name of the 'warp drive' of science fiction."

It is this term that the creators of *Star Trek* call the propulsion system of the *Enterprise*. In the popular television series and motion pictures, the two engines at the back of the starship use the collision of matter and antimatter – a theoretical combustive process that makes nuclear explosions look like firecrackers – to warp space around the vessel, allowing it to streak through light years of space in a matter of hours.



While Alcubierre's insight looks hopelessly impractical from our limited standpoint in the 20th century, it does show a way, in principle, that huge stellar distances could be traversed in reasonably short times.

If it did prove impossible to achieve in practice, the only other hope for faster-than-light travel is an idea that astrophysicists have been pondering for several years. It too calls for some fairly way-out engineering – the creation of a wormhole in space-time.

The possibility of space-time wormholes was actually first discovered as early as 1916 soon after Einstein had published the general theory of relativity. His equations show that it would be possible for the universe to have different regions which linked up via tube-like structures physicists now call wormholes. In a two-dimensional universe, the wormhole would appear as a tube connecting different parts of a flat sheet. Each entrance, or mouth, to the wormhole would appear as a circle or disc. In our three-dimensional universe, each mouth would appear as a sphere.

In his recent book *Black Holes and Time Warps*, physicist Kip Thorne from the California Institute of Technology describes how in 1985 he was asked to check out the science of space travel in a novel his friend, planetary researcher and science popularist Carl Sagan had written. In the novel the two main characters plunge into a black hole near Earth, travel through hyperspace, and emerge an hour later near the star Vega, 26 light years away. Although the idea of using black holes as a way of transporting people to other universes had been around for some time, theorists had discovered some major difficulties. In particular, Thorne realised that Sagan's idea would not work because a black hole would suck any stray radiation into it, which would be accelerated to enormous energies and destroy anything else, like a spaceship, in its path.

Thorne wondered whether the answer was to use wormholes instead. Initially, he was sceptical because the mathematical solutions that suggested the possibility of wormholes also indicated that they would be rather unstable; so unstable that the mouths at each end would be liable to collapse after only a short time.

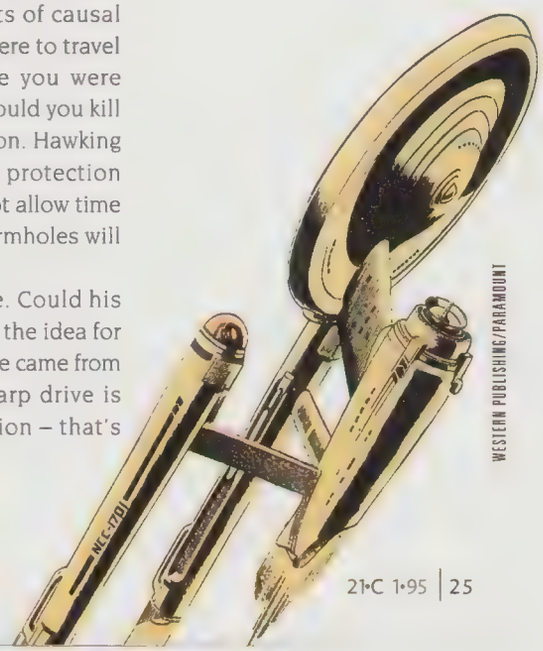
Thorne then hit on a way of reinforcing the wormholes to prevent them from collapsing. If you lined them with exotic matter, just like the matter Alcubierre calls for in his warp drive, the anti-gravitational field will prop up the edges of the wormhole, rendering it safe for travel.

In practice, you would need something extraordinarily heavy to do this – perhaps from a ghostly hole. **This is quite tricky, since collapsed stars are hard to come by near Earth, and how you would lug this lump of super-dense matter around is anybody's guess.**

So it suddenly looked like wormholes could be a possibility. However, it turns out that there are still some major problems with wormholes – so major that they may be fatal. For a start, it is not at all clear how you would actually create a wormhole. Although there are some hypotheses, it seems they lead to the possibility of a wormhole behaving like a time machine. If one mouth of the wormhole can be arranged to travel at close to the speed of light while the other one remains at rest on Earth, then it is possible to take a journey through the wormhole and find yourself emerging at the other end – before you entered the wormhole.

Some physicists, including Stephen Hawking of Cambridge University in Britain, find the possibility of time-travel so disturbing that they think some physical process will prevent the formation of wormholes. The problem with time travel is that its raises the spectre of all sorts of causal paradoxes, such as what would happen if you were to travel back in time and shoot your mother before you were conceived. But then, if you weren't born, how could you kill your mother? The result is a logical contradiction. Hawking has advanced what he calls the 'chronology protection conjecture', which says the laws of physics do not allow time machines. If Hawking is right, then it seems wormholes will not be an option for faster-than-light travel.

Which brings us back to Miguel Alcubierre. Could his theory really fly, so to speak? Alcubierre admits the idea for his mathematical solution to the warping of space came from watching television, but he doesn't think warp drive is necessarily science fiction. As for teleportation – that's definitely out. Or is it? ■



WESTERN PUBLISHING/PARAMOUNT

THE THEORY OF HYPERSPACE HAS THE WORLD'S BRIGHTEST PHYSICISTS SERIOUSLY CONSIDERING WHAT WAS ONCE THOUGHT FANCIFUL: TIME TRAVEL, PARALLEL REALITIES, WORMHOLES AND UNIVERSES OF 10 DIMENSIONS.

by Phillip Adams

Artwork by Christopher Kaiser

MULTIPLE DIMENSIONS AND TIME TRAVEL HAVE LONG BEEN THE STUFF OF SCIENCE FICTION. BUT, AS WITH SO MUCH SPECULATIVE FICTION OF THE PAST, THERE MAY YET BE A STRONG ELEMENT OF REALITY. OR, AS THE CASE MAY BE, HYPER-REALITY.

Even more challenging is the possibility that the theory of hyperspace (or higher-dimensional space),and the accompanying 'superstring theory', may be thé key that unlocks the elusive Theory of Everything: the long-sought-after Unified Field Theory which so occupied Einstein in his last few decades and which has had Steven Hawking stumped for years. It is speculated that such a Unified Field Theory will finally reveal no less than the secret of the origin of the universe.

Despite its Star Trekian overtones, hyperspace has inspired several thousand research papers and been the focus of over 200 international conferences. Michio Kaku has been a leading pioneer in hyperspace research. Kaku, Professor of Theoretical Physics at the City University of New York, has made one of physics' most difficult concepts into an accessible tome with his book *Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps and the Tenth-Dimension*. Kaku claims that perhaps the most profound discovery of the past century in physics has been the realisation that nature, at its most fundamental level, is simpler than anyone thought.

Michio Kaku

Phillip Adams: *Is this realisation a peculiar view of theoretical physicists or would your fellow scientists in biology and chemistry agree with that?* .

Kaku: Well I think so, I think that biologists when they look at the most fundamental unit of biological genetic information have decided that DNA – that is, the string of genetic information – encodes a fantastic amount of information. Essentially the blueprint to create an entire human being is

encoded on a string. So a string in some sense has been reserved by nature for a very special role, and now in physics we realise that perhaps all the thousands of particles that we see blasting out of our atom smashers with no rhyme or reason may actually be simply vibrations, like the vibration from a violin string, of a very tiny [spatial] 'string' that we call the Superstring. Now, what's exciting all this attention is the fact that these strings only vibrate in 10 dimensions

A mere 10?

A mere 10, that's right. Five to 10 years ago, anyone proposing higher dimensions and time travel and parallel universes would have been laughed out of the physics community as some kind of eccentric crackpot. However, now this is the centre of theoretical physics research; 5,000 papers have been published on these fields and 300 international physics conferences have now been proposed.

So this is the big fad at the moment?

That's right, things that in the past were considered subject matter for science fiction stories are now being teased apart by serious theoretical physicists. [They're contemplating issues such as] what happens if you go backwards in time and meet yourself, or what happens if you go backwards in time and kill your parents before you are born

Can you attempt to give us a simple definition of what you mean when you use the term 'hyperspace'?

Hyperspace, we think, is a real universe. That is, universes that actually exist in a dimension beyond our own. Now if you think of people living on a tabletop, for example, the flat-landers who are compressed like cookie men, they cannot visualise a third dimension beyond the tabletop and yet we, from the third dimension, can poke at them

ARTWORK: JON LOMBERG

A starship approaches a wormhole entrance, which is positioned in front of an Earth-like planet. The planet's image is distorted by the gravity of the wormhole.

"This is the theory that probably eluded Einstein in the last 30 years of his life... the theory of all physical knowledge".

Look down at them and they can't see us, can they?

They can't see us and we are essentially like gods, we can perform miracles on this tabletop that defy the comprehension of two-dimensional creatures. For example, we can perform surgery on the inside of these cookie people without even cutting their skin, as if by magic. Similarly, a higher-dimensional person beyond our familiar three dimensions of space is incomprehensible, because we evolved on the planet Earth and our brains evolved to handle emergencies in three dimensions, like avoiding sabre tooth tigers – not the ability to comprehend four, five and six dimensions.

Then hyperspace, redolent with extra dimensions, is not just a hypothesis or simply mathematical formulae?

It's a paradigm for reality itself. I like to think of a carp. When I was a child in San Francisco visiting the Japanese Tea Gardens, I used to see the carp swimming just below the surface of a very shallow pond, and I used to ask myself, what happens if I were a carp, swimming in the bottom of a shallow pond beneath the waterlilies? What would my universe look like? It would look very flat, very two-dimensional; and yet here I was sitting on top of the pond looking down, and I could grab one of the fish and lift it into hyperspace, that is, into my three-dimensional universe.

It's a marvellous image, but it suddenly makes me wonder whether you're suggesting that somebody is looking at us.

We don't really know for sure because these dimensions are extremely tiny. At the origin of the universe, we think the universe really did have full-blown 10-dimensional symmetry, perfect symmetry in 10 dimensions. But after the Big Bang, the dimensions collapsed and turned inward, and so we have these higher dimensions: the six dimensions that we can't see beyond our familiar three dimensions of space

Not only can't we see them, we can't smell them, touch them or taste them?

They're smaller than an atom. At the beginning of time, at the beginning of the universe, we now think that this was the key to the origin of everything. There was an explosion that took place, and six of the dimensions curled up, while four of the dimensions expanded extremely rapidly. In other words, the Big Bang is in some sense a rather minor aftershock of the collapse of 10-dimensional hyperspace. So we now have a very simple way of looking at the origin of the universe – essentially, the breakdown of higher dimensional, 10-dimensional space.

Simple for you, depressingly complex for the rest of us. How many are there who really understand this?

Well, there are about 200 of us who really work on the 10-dimensional theory.

That is a most terrifying elite.

My challenge was to write a book that even high school kids could understand. You realise that Lewis Carroll was a professional mathematician by the name of Charles Dodson, and he wrote under a pseudonym? I didn't want to write under a pseudonym because I wanted people to understand the tremendous explosive energy this theory has.

I think you have done a splendid job of simplification, but it still hovers above me like the Cheshire Cat's smile.

People watch *The Twilight Zone* or *Star Trek* on television and they have a very fertile imagination, and I think people like that would really take to this book like a fish to water.

You keep coming back to this fish of yours, which reminds me that with fish we have worms, and with worms we have 'wormholes'. Wormholes are very popular with you. Would you like to just run a few wormholes past us and the tantalising suggestions that come from them?

Months ago a black hole was discovered in outer space, a galaxy about 50 million light years away. The question is, what happens if you fly through the centre of this dead galaxy? Some physicists believe that if you fly a rocket right through the centre of a spinning black hole, you won't be crushed to death at all; there's a small chance that you could fly right through a tear or hole in space – a wormhole – and wind up on the other side of the universe. This, of course, is a favourite plot of *Star Trek*, but now physicists are looking at the stability of these objects as one flies through them.

Let's say we have Alice through the looking glass. On the other side of the looking glass is another universe. Our universe and this 'other universe' are joined at the hip like two Siamese twins and this hip, of course, is the looking glass.

Are you and I in this other universe having this chat in some surreal form or another?

It's possible – perhaps on the other side of the looking glass you and I are having yet another conversation, perhaps in the past, about this kind of theory

Oh I remember that, yes.

Now the thing that has tantalised a lot of physicists – and Stephen Hawking jumped into the game just a few months ago – is if you fall into one of these wormholes and go back into the past ... what happens if you wind up meeting your parents before you're born, and decide to shoot them? Now, if your parents are dead before you're born, then you can never be born in the first place.

Then how can you shoot your parents?

Right. This is the kind of paradox that is now the subject of many pages of physical review magazines.

You realise this is a terrifying proposition to some people, it undermines the last vestige of security.

To me it's exciting because under the old Newtonian paradigm, time was like an arrow; once you fire it, it never comes back, it always continues forward smoothly. Einstein said that time was like a river, it meanders around the universe and speeds up and slows down around stars. The new twist is that perhaps time can have whirlpools and perhaps time can fork, like a river can fork. Now if the river of time has eddies or whirlpools, this is fantastic. It means that we can now perform experiments, perhaps sending objects back in time.

Now, I should caution you that the energy required to do this is something that you're not going to find in your kitchen, or for that matter in any national laboratory. It exceeds the total energy found on the planet Earth, perhaps even in our solar system.

That comes as a great relief to all of us.

Well, we're not going to be able to go backwards in time and meet Christopher Columbus and convince him not to discover the New World. However, it does mean that perhaps other civilisations in outer space, if they exist, or perhaps future civilisations with enough energy, may be able to visit our time era.

Are you also running that argument, which I've heard some of your colleagues put, that there may be an infinite number of layered universes? That things keep splitting off, and every possible course of action or event is a reality in other parallel universes?

That's right. Stephen Hawking has a new twist to this and he thinks that there are perhaps many, many universes out there.

Take, for example, boiling water. If I have 10-dimensional water and I heat it up, and it starts to boil, each of these little bubbles corresponds to a parallel universe, and these bubbles begin to expand because, of course, symmetry has been broken, and this is a paradigm for the Big Bang. But this also means that as the water is boiling, there are many bangs, that there are many, many universes – perhaps very similar to ours – co-existing with ours. So *The Twilight Zone* plot where you wake up in the morning and people don't recognise you and say you never existed may not be such a far fetched idea.

If the water boils, and you have many bubbles expanding, then you have many possibilities of universes. Now the controversy is whether you can go between them. The probability of going between them is astronomically small, so you're not going to walk down the street one day and wind up backward in time. The point is though, it is mathematically possible that there is a leakage between these bubbles that are rapidly expanding.

Are there devil's advocates – or perhaps a more appropriate metaphor would be Doubting Thomases – people of great skill and professional reputation, who disagree with you guys? Who think that you're mad?

There is a split among Nobel Prize-winners. Two Nobel Prize-winners are Mary Gelmond and Steve Wynberg, who have said that this is probably it. This is the theory that probably eluded Einstein in the last 30 years of his life. This is probably the theory of all physical knowledge.

This is getting us close to the theory of everything, in other words.

However there are some 'Doubting Thomases': not because they think the theory is crackpot – they're amazed at how marvellous this theory is. They simply think it can't be tested; that we are essentially too primitive with our puny machines on the planet Earth, in a minor quadrant of our galaxy, to test a theory of all physical knowledge.

So they see any thought of doing that as hubristic?

Yes. So these people do not say that the theory is inconsistent or ugly or simply ridiculous. In fact, it has unsurpassed beauty that has startled the mathematicians and has opened up several new branches of mathematics on the way. The objection is that we are too feeble to test this theory, that with our primitive knowledge we cannot build time machines.

Now, in some sense, I feel like Isaac Newton 300 years ago. Newton could have calculated the energy necessary to launch the Apollo 11 Saturn rocket to the Moon; that about two million pounds of thrust was necessary. But he also knew back in the 1600s that all we had were horses and carriages. And here was Isaac Newton talking about the possibility of putting men on the Moon with rockets whose energy he could calculate on a sheet of paper, and yet all he had in the England of the 1600s were horses. That's how I feel today. Our machines, the greatest machines we have on the planet Earth, are like horses, and what we need are more like the Saturn rockets. ■

"Some physicists believe that if you fly a rocket right through the centre of a spinning black hole, you won't be crushed to death at all; there's a small chance that you could fly right through a tear or hole in space – a wormhole – and wind up on the other side of the universe."

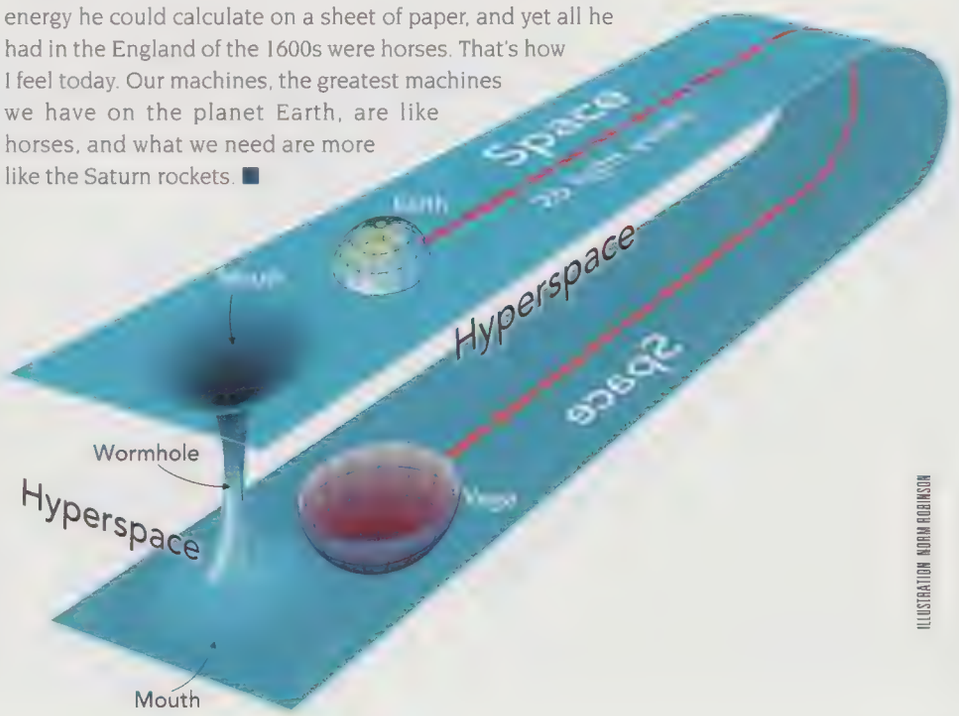


ILLUSTRATION ROBIN MATHESON

VISIONS OF THE INFORMATION SUPERHIGHWAY TEND TO AVOID ONE ISSUE: REALITY. FAR FROM BEING A MEDIUM OF FREE-FLOWING INFORMATION ACCESS, THE INFOBAHN IS A TRAFFIC JAM OF COMPETING COMPANIES AND GOVERNMENT ENTITIES JUST WAITING FOR THE CONSUMER TO BECOME SEDUCED... AND SPEND. **21•C** DISSECTS THE PLAYERS, THEIR PLANS AND THE FAIRY-TALES.

by McKenzie Wark

Artwork by Robyn Stacey

ONCE UPON A TIME...

Like some fabulous dream, it hits me. It's late. I'm up watching *Star Trek*. I doze off, and then without knowing if I'm awake or asleep, I'm floating along with a groovy young couple in evening dress. They're out driving in a cool car on a moonlit night. I hear a voice, from nowhere: "The highway..." Lush cocktail music plays, like Miles Davis on Prozac "... of the future..." Up ahead bright lights beckon, glittering headlights are everywhere, on undulating roadways, with no traffic jams. "... will have..." Everything looks futuristic in an ironic kind of way, sort of '50s in the '90s. "... noooo speed limit!" The camera yanks back. We're not on the highway at all. We're on a computer screen. "Shouldn't you be driving the fastest machine on the road?" It's an ad for the Apple Power PC. "The future is here..." Fancy colour computer graphics zip by. "And it's better than you expected."

It's the Apple vision of the information superhighway. Everything your little sci-fi addled head can dream of, only in an ironic kind of way. It wants to promise you and me a sleek, shiny *Star Trek* world, but it knows nobody can take that seriously. Welcome to the information superhighway. We all know it's just a fairy story but we enjoy the promise of it anyway. Wouldn't it be just peachy if a promised new media technology really did turn out to be like some sleek cool vehicle rather than like what it is – a pumpkin? If it really did live up to our expectations of a future often promised but never delivered. As Alan Kay, a Fellow of Apple Computers says: "This is the biggest thing since the invention of the printing press". I want to believe him. I really do. Like I want to believe *Star Trek* is real, at least until the ads break in

Even a year ago the information superhighway seemed like the real thing. The media went hog wild for it. The FIND/SVP consulting firm got its plug on the newswire announcing that the information superhighway made its list of top 10 business concerns for the first quarter of '94, along with telecommuting, gourmet pizza, alternative medicine and Mexico. That was then. Now everybody's vision of the superhighway is tinged with irony or at least a bit of plain old sarcasm.

So was it all just hype? Not exactly, but the fantasy is an integral part of it. It's a story we might call seven industries in search of a bank, a product, a market and a price. Advertising, marketing and public relations firms pumped up seven competing visions for the seven different kinds of industry who were looking for seven different ways to make money out of a dream. But with seven different dreams running on seven different screens, it got too confusing. Like Snow White, we found ourselves with seven giants all trying to take advantage of us with tall stories, and... wait a minute, should that be giants or dwarfs? Which story is this? Wake me when it's over

Did somebody say 'information superhighway'? Oh sure, beam me up now!

Now we can see the changes in broadband cable media with our eyes open, and it's not all that bad. It just ain't utopia. It's just the latest phase in the never-ending process by which American big business reinvents itself with a little help from the U.S. government – or more usually a lot. What President Eisenhower called the military-industrial complex is transforming itself into a military-entertainment complex and is taking the media, its investors and us along for the ride

The military-industrial complex is transforming itself into a military-entertainment complex and is taking the media, its investors and us along for the ride

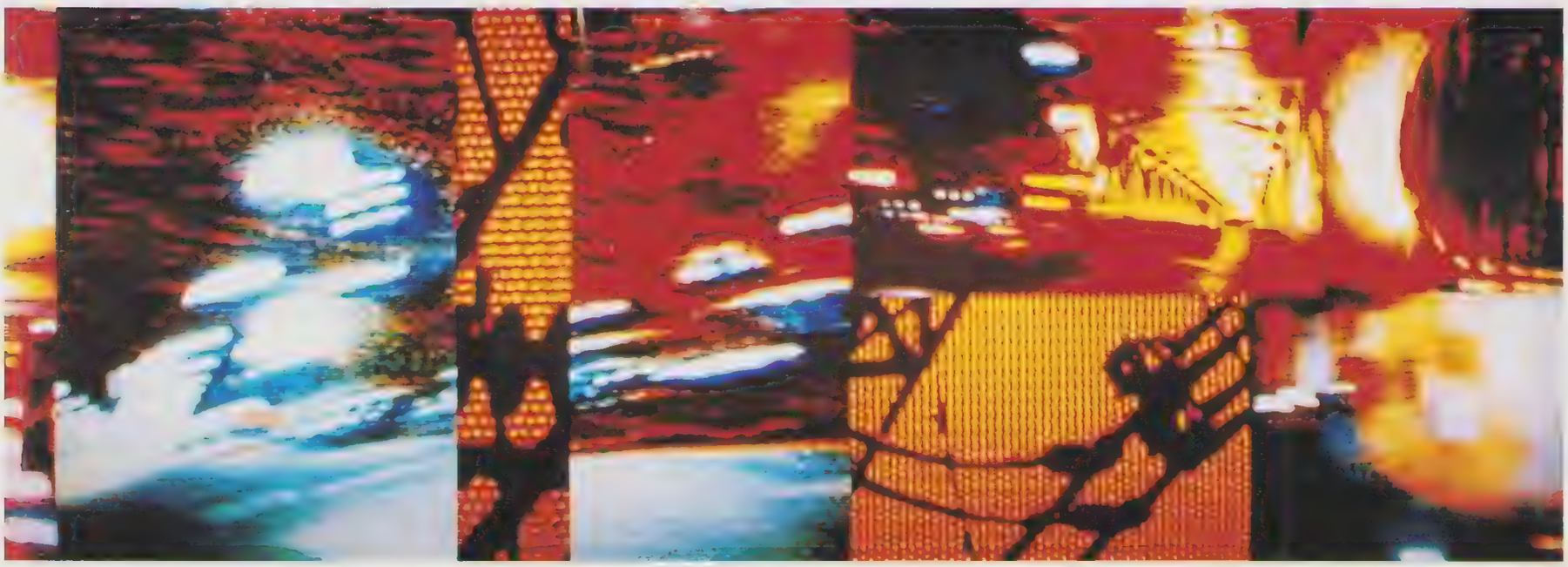
THE THREE GOLDEN INFO EGGS

So who are these companies and what do they want? Well let me tell you a story... It's not exactly *Star Trek*, but it does have three golden eggs and seven characters fighting over them Basically there are three kinds of golden egg that big companies might base their business around, for which they presently need a new market: information stocks, information flows and information vectors

Information stocks are literally that – warehouses full of images, stories, sound and movement, colour and light that have some enduring value. (Information flows, by contrast have little enduring value but are very valuable when 'fresh'.) A back catalogue of old movies, music, an archive of old magazines, even a decade's worth of economic data on the widget industry can be a valuable stock. It's just a question of packaging it the right way and finding the buyers. As the 'information economy' grows, so does the demand for its raw material input – information. Now that a lot of it can be stored in a digital form it can be more easily retrieved and can be packaged and repackaged in any number of ways. The problem is how to organise it so it can be offered cheaply to people who will pay money to access it

Information flows are less about buying and marketing durable information products than about establishing a network for gathering and distributing updated information on a regular basis. Its ways of thinking are in many ways diametrically opposed to the stocks business. It's not about hoarding durable information, it's about distributing it fresh. Anything from political and business news to fashion or comics count as information flows. Anyone from a stock exchange to a weather bureau might have a flow of information from which they can extract value. The problem, even more than with information stocks, is distribution. How can it be channelled as cheaply as possible to just the right people while it's still fresh and piping hot?

Information vectors are the means of delivery of either stocks or flows of information, or both. It's the pipe rather than the product. The information vectors of cinema, television, the telephone and mass print circulation dominated the landscape for ages, but things weren't always so stable. The present hype about the information superhighway is like 100 years ago, when print media were in turmoil and a brand new vector had just appeared on the scene. Later, it would come to be known as 'motion pictures'. Nowadays there's lots of new vectors from optical fibre to cellular phones and satellites. Vectors are no longer scarce and costly, they are becoming plentiful and cheap – and competing against each other as delivery routes for the stocks and flows of information that people want to buy sell and ship around to one another



Michael Eisner, Walt Disney's chief executive officer. He thought the infobahn was too 'Mickey-Mouse' for Disney.

THE GREAT EGG HUNT

Because the technologies were all so different and because American anti-trust law broke up the movie cartels and then the telephone monopoly, media firms thought of themselves as being in the publishing business or the movie business, or the phone business, but not a whole bunch of things at once. As the storage of information flows and stocks goes digital and the vectors of distribution proliferate, many now realise they are in the stock, flow or vector business, or maybe a little of each – and have to choose how to position themselves in relation to all three.

For example, the newspaper business is mainly about flows, but the printing plants, delivery fleets and subscription services are an elaborate and effective media vector. The strategy for newspapers for a long time has been to find new things to put into the newsprint vector to keep people buying newspapers. But maybe the newspaper business is not a vector business but a flow business, and the problem is finding a more attractive and efficient vector for what newspapers do best – the news in text and still pictures.

Or take the telephone business. It's mostly about vectors, but most telephone companies (telcos) keep an annual flow of phone books and directories coming at us. Would they be better off concentrating on offering dial-up value-added services of stocks and flows of information to their vector business, or should they concentrate on widening the pipe and leave the services to others? Would the regulators let them become information providers anyway?

The main thing is that all of the businesses involved in the flow, stocks or vectors angle of communications arrived more or less at the same time at the bright idea that it was better to position themselves across all three businesses at once. And so the great egg hunt was on for one and all! Each wanted a little piece of whatever looked like the biggest egg, only nobody quite knew which one that was. So everyone wound up with a bit of a curate's egg, a little of this media flow and a little of that media vector and maybe a few media stock toast-soldiers on the side. Everyone ended up with some good bits and some bad bits, only nobody knows which is which, now that the media business is so changeable.

Newspaper proprietors are pretty keen on coming up with an electronic alternative to chucking rolled up hunks of paper into your front yard

THE SEVEN GIANTS

And so the seven giant media industries began to covet each others media stocks, flows and vectors because of the nagging thought that for most of these firms, their existing market won't grow much more. On average, television is used for three hours a day, the telephone for 30 minutes. What do you do when everyone has a phone and a TV? How can you sell them new ones if they don't do any more cool stuff than the old ones? How can you get people to use them *more* when it's just the same old stuff?

The seven media giants were worried. But then one day they had the cheering thought that combining stocks and flows with new media vectors, rather than the rather tired old existing ones, might open a window on lots of profitable blue sky. The result was the great egg hunt of the late '80s, when the seven giants darted about in the corporate bushes, buying up small companies and taking over or merging with other big ones. This bewilderingly complicated corporate party game is still going on, although the details are really only of interest to the investors and the business press. The problem for the rest of us is to sift through the rubble of old press kits looking for the overall pattern in what the seven big industries involved were doing... or thought they were doing.

Now it's time to introduce those seven industries: their problems, their ambitions, and their secret desires to be more than they presently are...

1. THE MAJORS – FILM AND TV STUDIOS

Michael Eisner, CEO of Walt Disney, once said about this infobahn thing: "I don't get it, so we are not investing in it." In the long run maybe he won't have much choice. Movies are a flow kind of business, or so everybody thought. Until the studios woke up to the fact that in a media-saturated culture, nostalgia has its price. When all our cultural memories are from TV and the movies, then 'properties' like *The Flintstones* are also a valuable stock. With cable TV systems sprouting everywhere, it's no longer the case that entertainment products just zip by once or twice on their way to oblivion. It's a scary thought, but this precise moment, somewhere in the world, someone is watching a rerun of *The Brady Bunch*.

The frenzied buy-up of movie studios in the '80s was partly the result of the hunch that, with demand for product rising, the stocks movie studios owned were undervalued. Only demand is not rising fast enough. The studios are in a bit of a slump. Their core business – making new movies, has a problem. Costs are rising faster than the market is growing. So they want to expand their markets globally, by kicking down local content rules in places like France and Australia.

Failing that, they need to sell entertainment more intensively in the American home market, by finding new vectors of delivery. For instance, if you didn't even have to drive to the video store to get a movie, would you watch more of them? That's what the studio owners hope. So the studios

came sniffing around the information superhighway boondoggle, on the off chance that it might offer new vectors for delivering the flow of entertainment product and of reselling the old stocks. Which is why, unlike his boss Eisner, Jeffrey Katzenberg – chairman of Walt Disney Studios until his recent and sudden departure – thinks "It's full of promise."

● The TV studio vision of the information superhighway: I'm lounging around in the living room, so I turn on my TV and fire up some black box – they don't care what kind – and I punch into a remote control the commands for the evening's entertainment. I want two brand-new movies, an action movie and a romance (his'n'hers!) and some classic *Brady Bunch* repeats for grandma who's coming over, some *Star Trek* for later and while I'm at it I order up a bunch of *Ren & Stimpy* pencil cases to give out at my kid's fifth birthday party next week, then I settle back and relax...

2. RUPERT AND FRIENDS – THE NEWS MEDIA

The newspaper business is on a one-way trip to nowhere. Circulation of newspapers in the industrialised world is either static or declining. All that's keeping them afloat is the lack of an alternative vector of delivery that's more credible and comprehensive than the evening news, and the lack of market rivals.

So the newspaper proprietors are pretty keen on coming up with an electronic alternative to chucking rolled up hunks of paper into your front yard – or onto your roof. The wire services like Reuters and AAP already offer to-your-desk electronic information services to get the news flow to you, and specialised services like Dialog and Nexus can get you desktop access to the stocks of information stored in old newspapers and journals. But these services are expensive and really designed for the pros.

● The newspaper vision of the information superhighway: I'm sitting at my desk with some sort of computer in front of me, working from my study at home. I look at the report I'm writing and loosen my tie. The information I need isn't here and it's past midnight already! But with the click of a mouse, I dial the news service, and there before me is the updated data on the Laotian pretzel market in a nice set of coloured pie charts. While I'm there I check on my football pool – my home team's last three match results are right there. Then I check to see if there is any news report concerning my suburb, and feeling lazy and not like working, I fire off a letter to the editor and check out the entire run of *Doonesbury* cartoons for 1986...

3. THE HOME ELECTRONICS CROWD

Sales of televisions are booming in the developing world, but in our 'overdeveloped' world the last thing we need is more TVs. The TV makers can't really sell us on anything new while the basic picture and sound quality is so lousy. So they've been fighting among themselves about a thing called high definition TV. In other words, the same old TV with a bigger picture and clearer sound. But do people want to sit back as couch potatoes watching bigger and louder TV, or do we want TV we can control more? Hedging their bets, TV companies are not staking everything on more is better, they are also interested in making TV more 'interactive', so you not only see the ads, you can order the stuff right there with a flick of the remote.

● The home electronic vision of the information superhighway: Ding Dong! There's the doorbell. My friends have arrived. I usher them into the living room and wait for somebody to comment on it. It's the pride and joy of my home, my top-of-the-line home entertainment centre! When friends come over I pass them the remote and amaze them with all the... well, all the neat stuff you can get on this sleek black box with the brand name prominently displayed on the top left corner. The sound is so crisp! The pictures come up in a fraction of a second! And real soon now there will be a portable version....

4. SONIC AND MARIO – VIDEO GAMES

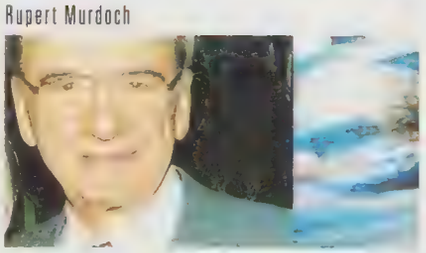
Nintendo and Sega have had a roaring decade selling very simple interactive media – the video game. But this market too is rapidly tapping out. Sega posted very bad profit results from its 1993-94 year of trading. One way they are trying to overcome the saturation and boredom threshold is with more sophisticated machines playing more complicated games, run off CD drives rather than cartridges.

And not before time. The big Japanese electronics firms like Sony who missed out on the video game boom are going to try to take this market off them. Another avenue both Sega and Nintendo are exploring is networking the games machines via the phone lines, so players can download new games, play each other long distance or turn their machines into easy-to-use data terminals. So like the movie makers and the TV manufacturers, they have an interest in doing deals with communication networks to stay in the game.

● The Sega/Nintendo vision of the information superhighway: I bought it to keep the kids off the street but discovered how much fun it was for myself and now the kids can't get me off it. I'm sitting cross-legged on the floor in front of the TV, with the neat little control pad in hand and the goggles on, playing *Mortal Kombat* V with some nice sales manager from Cleveland – there's her picture in the top corner. She's winning 97 games to 83, but I'm picking up. I dialed up the interactive advanced training module last night. Just in time too, cause *Mortal Kombat* VI comes out next week...

Jeffrey Katzenberg

Rupert Murdoch



Everyone has the hunch there's a new market out there somewhere. What it needs is for some fairy godmother to ease the risk of investing in what will be a slow process of shifting to new media technologies

REUTERS/BETTMANN

Ray Smith, Bell Atlantic's chief executive.

5. THE SILICON VALLEY CYBERNAUTS

Computer manufacturers are up against it too. PC sales are kicking along, but PCs are not a very lucrative business anymore for anyone but the Taiwanese clone makers. What the big computer firms need is a whole new market for a home electronics device which allows you to manipulate more than just words and numbers, but sound and images too, and it needs to be plugged in to a ready flow of images and sounds and words. But would this be a much smarter version of existing TVs or a much easier to use version of a home computer? Or could it be a Sega or Nintendo machine with a few do-dads added on?

As IBM senior vice-president James Cannavino says, "the set-top box is the engine that will put subscribers onto the information superhighway". If the broadcasting or cable bandwidth is there, you can be sure they will all fight it out to put a box in your living room that will allow you to get pictures, sound and text when you want it and how you want it.

- Silicon Valley's vision of the information superhighway: It's so educational! Last night I took a guided multimedia tour of Peking in the 19th century. Tonight I'm a dinosaur. Later on, when the kids go to bed I'll check in to the on-line hot tub and talk dirty with that lab technician I met there last week. But first, I dial up cuisine on-line and order a gourmet pizza, delivered.

6. THE TELCOS

The telcos have a problem. Says Ray Smith, Bell Atlantic's chief executive: "We have reached the limits of our original franchise but believe we have tremendous opportunity to find new ones if we can re-invent ourselves around a new r arketplace with a whole new set of requirements." There's not many new customers, and they don't use a whole lot of phone time. The telcos' main response has been to try and pinch customers from each other. The long distance carriers want to go after the regional phone companies' customers and vice versa.

Of course, this is a zero-sum game, so some of the telcos have also taken a passing interest in finding ways of offering new services to the home to ward off competition from cellular operators, and cable TV, and persuade us to use more time on the line. But it's not going to be easy for companies that are basically all vector, and not really into providing any kind of information that isn't about phones. And as anyone who has actually tried to read the phone book knows, it's big on characters but thin on plot. Richard Notebaert of Ameritech Corp, a regional phone company says: "Creating the superhighway is the easy part, but creating the kinds of services that consumers will use again and again, that's where mistakes will be made and where we will find some 'roadkill' along the way."

- The telco vision of the information superhighway: I'm on the phone a lot. They don't really care what kind of box it comes out of, so long as stuff goes over their vectors and the government frees up the regulations to let them offer it.

7. THE CABLE TV UPSTARTS

Regulation was on the minds of the cable businesses almost as much as the telcos. Some of the cable companies have been doing pretty well, so much so that they attracted regulatory attention in the U.S. and a price cap on basic cable services. Like the telcos, the cable companies are in the vector business. Their market is growing enormously outside America, but back home all the lucrative markets are already wired up. So in the home market they are turning their attention from wiring up the country to extracting more rent from what passes over the wires. That's why they would like to offer telephone services via their co-axial cable networks, and anything else they can think of.

As Ray Smith said of the deal his phone company nearly did with the cable company TCI: "Basically, both cable and telephone businesses are mature businesses with mature technologies, customers and product lines." That's why cable companies like TCI toyed with the idea of getting into bed with one or other of the phone companies that could help them with the technology, the stocks and flows or the politics of getting the regulations changed to let them into the phone market. More likely, they will look for alliances with the holders of information stocks and flows, so they can broaden their offerings to cable customers while offering services with well-known brands.

- The cable TV vision of the information superhighway: Remember when cable remotes had 70 buttons on them? Well now they've got 592! If I want to watch it, they've got it. Old movies! New movies! Sitcoms! Cop shows! Home shopping! Home banking! I'll never have to leave home again, ever – well, not to shop, anyway...

THE DANCE OF THE SEVEN GIANTS

In short, there are competing, even contradictory visions of what kind of consumer object of desire the information superhighway might be like. Lots of companies put out press releases and toured trade shows with more or less actual deals and technologies to trumpet that allowed them to claim that they were ahead of their rivals in making the thing a reality.

But it turns out it was virtual reality – most of it was hot air, aimed at testing the market or boosting stock prices.

Test installations of infobahn-like new media are pretty common, but actual examples are few and far between, and the results are far from encouraging. A widely reported study by Andersen Consulting of New York came up with the calculation that the amount of time consumers currently spend on activities that might migrate to the infobahn is only about 3.5 hours per day. Assuming that no more than 30 million households have such services available to them by 1998, that's a market of about US$15 million. "But an important part of the pilot tests will be the need to demonstrate what is the elasticity of that curve and what people are willing to spend per hour on new activities."

Still, everyone has the hunch there's a new market out there somewhere. What it needs is for some fairy godmother to ease the risk of investing in what will be a slow process of shifting to new media technologies and cultures that are largely untried. That someone is government, the eighth player.

THE FAIRY GODMOTHER – THE GOVERNMENT

During the last U.S. presidential election campaign, Clinton and Gore drummed up a lot of support from Hollywood and Silicon Valley with Gore's 'information highway' plan. After the election the media added 'super' to Gore's 'highway' and the fairytale was off and running.

It is highly unlikely that there will be a large role for government in constructing the new infrastructure to ship information around, but there is a very necessary role for government in co-ordinating standards, policing the competition and safeguarding public access, and in being a 'leading edge' user of the services to start the market. The Clinton administration has moved on all these fronts. The military and university research sector is where the heavy users for new information networks are already located, and the administration has made available not insignificant seeding money to develop new standards and uses. A series of public policy meetings and committees has drafted a policy that combines market principles with some public policy goals, like wiring up hospitals and schools, and some statements about 'access'.

• The U.S. government's vision of the information superhighway: It doesn't matter where you are or what you do, there it is! Information! Information to make you work faster, harder and smarter – to compete against the Japanese. Information for doctors in remote hospitals so they can make tricky diagnoses – without having to consult costly specialists at the taxpayer's expense. Information for kids in school, so maybe they'll stay in school, designing video games rather than playing them. Information for researchers in chemical and electronics labs, keeping them one jump ahead of the Germans. Information for the government itself...

TOWARDS THE MILITARY-ENTERTAINMENT COMPLEX

None of this is unprecedented in American industry policy. For 50 years industrial renewal in the U.S. has been sponsored by industry policies shepherded by the Department of Defense. The computer industry, in its first couple of decades, was almost entirely the product of Department of Defense largesse. Since the end of the Cold War, things have changed. Clinton wants to use the Department of Commerce, not Defense, as the policy and research sponsoring engine to get this new cluster of industries off the ground. The heart of the American economy used to be the military-industrial complex. Now it's the military-entertainment complex. As Scott Sassa, president of Turner entertainment group says: "It is important in terms of competition inside the country and outside the country. Entertainment is the second largest surplus export in the country and I don't think defence is going to grow any more."

American legislators are not about to build electronic highways, but are funding research and overhauling communications legislation. The new legislation has to reflect the reality that the communications industries are no longer separated by being on different technologies. Broadcasting, computing, publishing and telephony are not exactly converging just yet, but they certainly overlap.

James Cannavino,
IBM senior vice-president

ELECTRONIC DEMOCRACY

The problem is that the legal rights and responsibilities of publishers differ from those of broadcasters, which differ again from those of common carriers like the phone companies, which are also different from the cable TV regulations, and so on. Phone companies have to provide service to everyone, but are not legally responsible for anything anyone says over the phone. Cable TV companies have to provide some community access, but don't have to offer service to everyone like the phone companies. Publishers in America have constitutional protection which does not necessarily extend to broadcasters. Both are legally responsible for what they put out, whereas phone companies are simply common carriers and have no such responsibility.

So while it is all well and good to talk about opening up a new market by breaking down the legal impediments to competition between these information industries, that does not address these very serious issues of electronic era democracy and accountability. No technology automatically extends or guarantees civic and civil rights. Whenever we hear how diversity and democracy will flourish as soon as the markets are freed and the optical fibre laid, we should remember another fairy story, from not so long ago, about how a wonderful force for democratisation was coming – television!

continued on page 93...

We should remember another fairy story, from not so long ago, about how a wonderful force for democratisation was coming – television!

TALES FROM THE CRYPT

by Rosie Cross and Matthew Gream ■ Illustration by Ian Haig

PRIVACY ON THE NET IS UNDER ATTACK, AND THE INTELLIGENCE COMMUNITY – WORRIED ABOUT NET USAGE BY TERRORISTS AND ORGANISED CRIME – IS LEADING THE CHARGE, SEEKING TO EAVESDROP ON ALL ELECTRONIC MAIL. BUT WILL THE TECHNOLOGY FOR ELECTRONIC WIRETAPPING BE USED TO 'PRESERVE AND PROTECT' SOCIETY OR THREATEN THE WIDE OPEN DEMOCRATIC SPACES OF CYBERSPACE?

PHIL ZIMMERMANN

PHIL ZIMMERMANN IS IN HOT WATER WITH THE FBI. HE IS ACCUSED OF DELIBERATELY EXPORTING SOFTWARE THE FEDS CONSIDER DANGEROUS TO THE NATIONAL INTEREST AND, IF CONVICTED, FACES FOUR YEARS JAIL FOR HIS TROUBLE.

Zimmermann's PGP (Pretty Good Privacy) software flies in the face of the Clinton Administration's plans to introduce key escrow encryption – known as the Clipper Chip – a proposed 'public key' encryption system designed by the U.S. government's National Security Agency to be implanted in every American phone, fax and modem.

In effect, Clipper is a hardware system which would act as a listening device, allowing federal agencies authorised by the attorney general to effectively wire tap most forms of electronic information. Purportedly 16 million times stronger than the existing federal standard, DES, the Clipper Chip has become the centre of a furious debate between government officials and civil liberty organisations. The alternative to the government's eavesdropping is 'private key' cryptography, such as PGP, disguising messages in ways that evade the prying eyes of the State and spook agencies.

Cryptography, the science of secret writing, dates back some 2,000 years to Caesar's Rome and before that, Mesopotamia and China. The relatively simple concept of keeping messages secret between two parties became more complex in wartime. And this is the government's main defence for using cryptography: the ability to break codes has had major impact on how wars have proceeded and been won.

Indeed, the forerunners of modern computers were invented largely in order to solve cryptographic problems. During the Second World War, the Germans developed the encrypting machine known as Enigma. The Enigma machine scrambled messages in such a way that if letters, or groups of letters, were the same and appeared many times in the message, then the same type of text or encrypted message would not come out. One of the very first computers, developed by Alan Turing, was used to decipher some of these machines.

During the Cold War, governments armed themselves with the means to spy and monitor communications, exclusively holding the key to secret codes. But this control became chaotic in the 1970s with the birth of public key cryptography. New mathematical algorithms enabled a break from one-key cryptography. These new systems allowed for two keys, private and public. The public key could be widely distributed, while the private key was well guarded by the owner. It is this ability to communicate in unbreakable codes which has caused concern and posed a major problem for governments.

Today the U.S. government is retaliating against Zimmermann and his ilk, and the battle is heating up. On one side are such government policy supporters as Professor Dorothy Denning, a world leading cryptographer and a reviewer of the Clipper system. Despite the great opposition from business and civil liberties groups, Denning vigorously defends the government's position to control the keys.

Opposing Denning and the Clinton Administration's struggle to sell Clipper to the people, are groups like Computer Professionals for Social Responsibility who actively campaign to inform the public on issues of privacy. Policy analyst David Banisar deplores the impact that proposed surveillance technology is having in the United States. Also sceptical of the government's position on Clipper is John Perry Barlow of the Electronic Frontier Foundation who believes the technology is open to abuse. Contemplating the prospect of being put on a government databank for actually discussing these issues, these key players debate one of the many evolving dilemmas on Netopia.

Phil Zimmermann: Today we live in the information age where almost everyone has a personal computer and a modem, but with electronic mail it's like sending messages on a postcard, your electronic mail passes from computer to computer across the Internet and can be intercepted and read by anyone along the way, including governments. So for us to protect the health of democracy and inoculate the body politic against possible government abuses in the future, I feel we should be building a technology infrastructure that has secure electronic mail.

PGP is a program that encrypts electronic mail and runs on a personal computer, letting you send e-mail to people that you've never met without the prior exchange of encrypting keys. It uses a technology called public key cryptography to do this. This defacto standard for the encryption of electronic mail has spread all over the world. I am currently under criminal investigation because the U.S. government has laws against the export of encryption software. They regard it as ammunition. The State Department has rules about exporting munitions – in the form of a munitions list. Anything on this list can only be exported with a licence from the State Department. PGP is strong cryptography, it can't be easily broken by the government, so there's not much chance of them granting an export licence for it. But because PGP was published as free software it has spread all over the place in a very short time. And the U.S. government is taking the position that the electronic publication of PGP is the same thing as exporting it. Maria Cantwell, our national representative from Washington, where Microsoft has its headquarters, has proposed legislation that would lift all the export controls on encryption software, but the National Security Agency (NSA) is against such a law, they want to keep the export controls in place. The mission of the NSA is signals intelligence, and that's something that they still want to preserve. If widespread encryption software becomes available, then they're afraid that they won't be able to decipher as much traffic.

THE U.S. GOVERNMENT HAS LAWS AGAINST THE EXPORT OF ENCRYPTION SOFTWARE. THEY REGARD IT AS AMMUNITION

We need stronger encryption like PGP, but we need those encryption methods to become more widely available to make people's private business communications safe from major governments. The Internet has potential for decentralising power to some extent. There are social structures arising on the Internet that are unique to Internet. It's possible to have digital cash that's non-traceable. Transactions could be conducted using cryptography on the Internet. There's all kinds of interesting social experiments that could be unfolding now.

Roger Clarke: The problem with the Internet is that, unlike the telephone which is extremely hard to analyse automatically (you've got to have people sitting and listening), with electronic mail you have a stream of ASCII data which is analysable by any machine that is plugged into the network.

> ZIMMERMAN: I CAN EASILY IMAGINE THE SINGAPORE GOVERNMENT EMBRACING THE CLIPPER CHIP, FOR EXAMPLE. SINGAPORE IS ALREADY A SURVEILLANCE SOCIETY WITH VIDEO CAMERAS AND ELECTRONIC MONITORING DEVICES AND FINANCIAL-TRANSACTION MONITORING EVERYWHERE.

What that means is that on the occurrence of more than three words which are deemed to be seditious or indicative of terrorist activity or drug dealings or whatever, the computer program clicks over and the message goes into a pile; therefore the name of the sender and the name of the recipient go into a pile of people the agency had reason to monitor in the past. It's that kind of suspicion building which can be automated through what I call data-veillance, which are the real fears of text messaging as opposed to voice messaging.

These spook agencies need to be more efficient, in the same way that every government agency needs to be more efficient in its monitoring of tax evasion. In order to do that, they have to automate their surveillance. At present, on the budget they've got, they can only subject a relatively small number of people to surveillance because they have to have people physically sitting, listening to telephone calls. By having a computer system that will do that for them, they're able to spread their surveillance net much wider. Unfortunately, there are many conversations which mention nasty words like sedition and drugs and all those other key words that are fed in – well I've just mentioned them so if we were having this conversation in text, our names would now be in that database.

Zimmermann: I received some electronic mail last week from a reporter in Bangkok who is in contact with some political opposition groups in Burma using PGP, and they're being taught to use it in jungle training camps on portable computers, and they're taking that knowledge and training others in other jungle training camps and it's helping morale over there. Major governments have cryptography, but now it's possible for disempowered groups to have cryptography as good as that used by major governments.

I can easily imagine the Singapore government embracing the Clipper Chip, for example. Singapore is already a surveillance society with video cameras and electronic monitoring devices and financial-transaction monitoring everywhere. Putting Clipper into that kind of society would be easy to do. If there is not enough citizen opposition, there is the danger that Clipper could spread horizontally around the world and become entrenched as an international standard.

Professor Dorothy Denning: Public key cryptography has two great advantages. One is that it's provided with the mechanism for digital signatures. These are extremely valuable, especially as networks will be used more for electronic commerce. The other is that it's given us a way of exchanging secret keys which are the keys used for encryption. So it provides a way of disseminating and exchanging those keys so that they can be carried on secure communications.

Rosie Cross: Are you opposed to people like Phil Zimmermann releasing something like PGP?

Denning: I don't think it's a standard that most people should adopt. First of all it doesn't solve my criteria for user-friendliness. The average people are not going to use encryption unless they can basically get it with the push of a button. Right now using this system is considerably more complicated than that.

We need Clipper Chip because we'd all like to have a secure way of communicating, and this will provide it on the telephone, which is what it's designed for, and it doesn't require a lot of effort to use it. As a society I think we want Clipper Chip so we won't end up creating a safe haven for criminals to conspire and undertake criminal activity in a way that shuts out law enforcement.

Clipper is used to secure your telephone communications. The chip would be embedded in a device so you'd basically push a button on the device saying 'phone secure' and the person on the other end would do the same and then the communications would get encrypted. What it will do is scramble up all the communication so if somebody is listening in, they won't be able to understand what you're saying. At the same time the chip will put out some information, such that if the government has a court order to do a wire tap of the communications, they're able to get access to encryption keys that will allow them to get access to the communication. Each device has a secret key and when the device is manufactured the key is split into two parts, then when the government has their court order, those two parts are loaded into a device which will then combine them and decrypt the communications on the channel. So the Clipper Chip will ensure that if people are using this encryption scheme, they won't be able to use it counter to the interests of society.

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Trudi McIntosh is the multimedia reporter for 'The Australian' newspaper.

David Banisar: Computer Professionals for Social Responsibility is a membership group mostly made up of computer scientists and others in the computer industry. We started originally looking at the social implications of using computers for military purposes. Star Wars [a planned space-borne nuclear defence shield] was one notable example of stuff we worked on back in the early '80s.

Since then we've moved on and are now looking at how the technology affects society generally. In this particular office in Washington D.C., we look at civil liberties issues – how technology affects privacy and free speech. There's a lot of people out there opposing Clipper. American industry is almost universally against it. The civil liberties groups all oppose it, even international industry is strongly opposed to it. The International Chamber of Commerce came out against it fairly recently.

Cross: Do you think Dorothy Denning has a point at all?

Banisar: I think the difference between Dorothy's position and ours is in how we see the relationship between a government and its people. She is willing to trust the government to act within its lawful behaviours and to always act in the best interest, whereas we take a slightly more sceptical view of the world.

CLARKE: THE IMPORTANT POINT ABOUT THE CRYPTOGRAPHIC SCHEME IS THAT THE SPOOK AGENCIES HAVE GOT THE ABILITY TO CRACK THE CRYPTOGRAPHY, SO THEY CAN LISTEN IN BUT NOBODY ELSE CAN AND THAT'S PROBABLY GOING TO BE THE PRACTICE.

There's a couple of problems, depending on which perspective you are viewing from. From a privacy perspective it seems the government is asking us to give them the equivalent of our house keys and then expecting us to trust them not to break in and drink our liquor when we're not there. From a technological standpoint, it's a real nightmare for anybody who wants real security to have to implement this chip into their products. From a purely technical standpoint, most hardware or software companies are writing things into software. They write a program and if they screw up the program they can just start over again, they can replace the software with new software

If you build something into your system with hardware, it's going to cost a lot more because you have to build all the necessary circuits and if it's bad, if it goes wrong somehow, if it gets compromised, you're going to have to throw the whole thing out and start over again with a new piece of hardware rather than simply reprogramming.

Clipper has been around for at least four years. It started under the Bush Administration and was probably being thought about under Reagan. Under the Reagan Administration there was some pretty widespread domestic surveillance. People that opposed his plans in Central America were constantly spied on, as were regular library users. The FBI was going to libraries and saying, if a user has a foreign name then we want to know if they're reading anything we think they shouldn't be.

Denning: That's just nonsense. It's true that the threats have changed over time, but that doesn't mean that they're not there. The threat of international organised crime, for example, is becoming a more serious problem globally, to the extent that we can't effectively deal with it in our country and it's going to become a more serious problem here as well. Wire taps have been one of the key tools that have been used to deal with organised crime. So if we lose that capability, potentially we could suffer some really devastating consequences. Another area is terrorism, and there again wire taps are used in over 90 per cent of cases.

Banisar: Terrorists wouldn't use it in the first place. If they're smart enough to use an encryption device, they're going to be smart enough not to use that one. So basically the only people who are going to use Clipper are those who can't afford anything better.

Barlow: Government is by its nature inclined to invade all the possible spaces of control that it can get its hands on.

Denning: Based on everything I've seen so far, I think that the control will be extremely good, and I consider that that risk is going to be acceptably low. I think it will be very hard for somebody either in or outside the government to conduct an illegal wire tap with Clipper.

Barlow: Dorothy has a lot more faith in the morality of government with unlimited power than I do. She seems to think that existing legal restraints on the spook houses and the FBI are going to be sufficient to hold them from unethical behaviour, even after they've reached the ability to automatically monitor the transactions of just about everybody who uses communications. The national security apparatus in the U.S. grew up during the course of the Cold War to be one of the fundamental elements of the economy. There are thousands of people who make their car payments on the basis of a threat which no longer exists, so in the absence of that threat the government had no choice but to foment new ones.

Ted Nelson: I have probably heard as many conspiracy theories as most people, but conspiracies do exist after all. The Clipper Chip is a complete phoney because it would, in fact, be very easy to defeat the Clipper Chip. So that even if it is in the equipment the government can't read it, simply by encrypting the message a couple of times beforehand and creating a scramble means that the government cannot read by the same method. The ostensible purpose which makes it possible for the Feds to read everyone's transmissions is total bullshit since they would not be able to read the transmissions of anyone who cared. The genuine purpose has to be and can only be to create a situation where they can search and seize on suspicion of conspiracy to encrypt. And it will give them the right to seize the computers and possessions of anyone who is under suspicion of encrypting.

Barlow: Well, I don't believe in conspiracies. I believe that what is generally regarded to be conspiracy is simply the automatically united endeavours of various forms of self interest. I mean you don't require a conspiracy to see that there are people that want to enhance governmental control for their own institutional purposes. These large agencies are like organisms and they want to survive and they want to have as much control as they possibly can.

Cross: How do we know the cypherpunks can't be accused of the same thing?

Barlow: Well, the cypherpunks seem to be trying to create a situation where control is simply not possible to anybody.

Banisar: They tend to believe that cryptography is the solution to all of our problems. I'm a little sceptical of that particular scenario myself, but they are very active in discussing among themselves technical solutions for various problems such as Clipper. Cryptography is the tool that can be used to solve some privacy problems, but it doesn't solve all of them. It can certainly be used to make communications secure, but it doesn't secure us from government bureaucracies ordering us to give information to them and them matching that information among themselves or passing it on, and it doesn't keep businesses from doing the same. Just as you can use a $50 bill when you go out to a restaurant, and there's no transaction data which can be collected and looked at, cryptography can be used to create a digital cash which can do the same. The same will also work for intelligent vehicle highway systems – cryptography can be used to protect medical records on smart cards in a variety of ways.

There are a lot of different definitions of privacy. The right to be left alone is the key part of privacy, to not always be accountable for everything you do. If you go to a grocery store and buy a six-pack, is there a reason for them to have that information? Is there a reason for a big database somewhere to collect that you bought a six-pack on Monday and a 12-pack on Tuesday, which maybe you bought for your neighbour anyway?

Caelli: There's no other techniques known. Cryptography is our tool of trade for providing those security services we need in telecommunications, computer systems and the telecommunications network. For example, the much-hyped superhighway of the future will absolutely depend upon cryptography.

Clarke: The essence of what the cryptography argument is about is that the government is attempting to dictate what form of communication mechanisms we can use and what kind of garbling we're allowed to impose. Now remember there's technical issues as well. The Clipper Chip is designed to work in the U.S. telephone system, and it's still a telephone chip at this stage. There isn't a chip yet for handling data communication, although one is proposed. The Australian telephone system is rather different technically to the U.S. one, therefore I suspect that that particular chip might not work, but the design would. All they'd have to do would be to build a slightly different chip that would interface the Australian system. The important point about the cryptographic scheme that's used is that the spook agencies have got the ability to crack the cryptography, so they can listen in but nobody else can, and that's probably going to be the practice. It will probably be, for practical purposes, uncrackable. If they were in a position to totally impose that on every telephone in the U.S., or Australia, then I'd be much more concerned, but at this stage that is not what they're proposing.

CLARKE: THE ESSENCE OF THE CRYPTOGRAPHY ARGUMENT IS THAT THE GOVERNMENT IS ATTEMPTING TO DICTATE WHAT FORM OF COMMUNICATION MECHANISMS WE CAN USE AND WHAT KIND OF GARBLING WE'RE ALLOWED TO IMPOSE.

Professor Jennifer Seberry: The Japanese developed their own indigenous encryption algorithm which they call FEEL. FEEL was presented at international conferences and was broken, so they put out a new version, and that was broken, and so they put out a new version and it was harder to break, but everybody said, aren't the Japanese stupid, you know, they're putting out their algorithms and everybody's breaking them. But many of us felt, aren't they smart. They put out their algorithms and get the best people in the world to find out what's wrong with them for free. Well, the Japanese, having got a version of FEEL now which is in all of their products, have gone and sold it, while we continue to be preoccupied with our own problems. They've sold it to all of the Middle East, they've sold it to the whole of Africa. They went into new and different markets. Australia has developed encryption, but we can't get it approved for export in any version at all.

Trudi McIntosh: Rumours indicate that Canberra is very wary of the hostile reaction that the Clipper Chip has already received in America. The American public is not happy about it one iota. The days of it being introduced are still very far off. In fact, I don't think it will get off the ground. I think it's going to collapse.

Clarke: Yes, things are done through the back door and there is this phenomenon called 'function creep'. Once you get something useful like the tax-file number in, then you'd want to use it for something else. It would be very easy to justify. So, yes, there are fears like that, but I think we've got to avoid painting the government as a bunch of devils from beginning to end. There are some things the government needs to do. The idea that governments should actually establish an encryption scheme for themselves isn't of itself a bad thing, it's how they do it. It's how much it imposes on the populace and the extent to which they create a scope for a future totalitarian government to repress the individual's thinking and speaking. They're the real issues. ■

Cultural OFFENSIVE

FROM FLAME-THROWING ROBOTS TO MANIPULATOR ARMS THAT SMASH THROUGH GLASS, SRL IS BRINGING APOCALYPTIC ART TO THE MASSES.

by Adam Lucas

Survival Research Laboratories has acquired a global cult status in recent years through its anarchic, gut-wrenching machine performances; theatrical displays which blend high and low technology and transform junkyard, industrial and avant-garde aesthetics into explosive socio-political satire. To some, SRL is a group of offensive, anti-Christian war-mongers who "have been known to torture and even kill live animals, trapping pigs inside machines and cutting the heads off chickens". To others, they are geniuses – perhaps of questionable sanity – who draw attention to everyday technological violence.

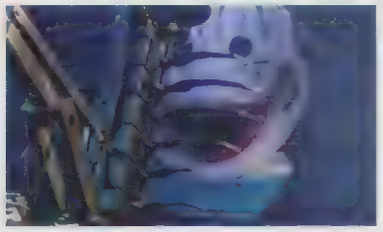
Although SRL has long been dogged by rumours, and even blatant scare-mongering by some anti-vivisectionists and fundamentalist Christians, it denies ever having killed or tortured animals in any of its performances.

The Western taboo of using animal carcasses for anything but human consumption or roadside fertilizer meant that SRL's incorporation of dead animal parts in its early machine performances, in such grotesqueries as the "Mummy-Go-Round," part of a 1982 performance, predictably aroused the ire of moral guardians.

Obviously, SRL touches a lot of raw nerves. And yet it is extraordinary how many law-abiding citizens subject themselves quite happily to an hour-long spectacle of machine mayhem, and then write to SRL and local newspapers complaining, to quote one letter, about "an arts organisation which pays an artist to commit acts of violence".

One line of argument is that by satirically representing the mindless violence and alienation which permeates modern society, the artists are condoning, celebrating and perpetuating that violence and alienation. However, such a critique is ahistorical. It ignores SRL's similarity to many different forms of cultural representation and comment which incorporate notions of the grotesque, disfigurement and violence: theatrical and artistic traditions such as French theatre of the Grand Guignol in the late 1800s, and Dada of the 1920s; as well as a long literary tradition of articulating the sources of transgression and the profane – from the sexual deviancy of de Sade to the misanthropic visions of William S. Burroughs – whose Western roots can be found, if we believe Nietzsche, in the Dionysian cults of the ancient world.

Desire for a peaceful world causes difficulty acknowledging the dark side of human nature; the violence and aggression which some call the "survival instinct", others "the will to power"



Since 1979, SRL has been staging "Spectacular Mechanical Presentations," to use its own publicity line. The San Francisco-based group is led by its founding artistic director Mark Pauline. For the first three years of SRL's existence, Pauline worked solo or called on friends; as various members joined the group, the collaborative aims also shifted, from machine performances when Matt Heckert and Eric Werner joined in 1982, to the larger and more plastic performances after their departure in 1988. Now, six or seven core members make up SRL, along with an equal number who are involved less frequently.

SRL describes itself as a group of "creative technicians dedicated to redirecting the techniques, tools, and tenets of industry and science away from their typical manifestations in practicality or product". With titles like "Illusions of Shameless Abundance", "Mysteries of the Reactionary Mind", "Will to Provoke", and "Delusions of Expediency: How to Avoid Responsibility for Social Disintegration by Acting without Principle under the Pretenses of Utility", SRL has staged almost 50 shows in the United States and Europe to enthusiastic and at times bewildered crowds.

The ingenuity and variety of their adapted and scratch-built mechanical devices is extraordinary. SRL's earlier efforts include the "Big Arm", a six-metre-long combination backhoe and dinosaur; "Big Man", a giant robot with a spinning head and flame-thrower arms; a three-metre-tall "One-Ton Walking Machine" that looks like a starved elephant; a four-legged creature called "Inspector", which resembles a hospital bed with clawed arms; "Sprinkler From Hell", an industrial sprinkler converted into a flamethrower; "Throwbot", a 600 kg catapult used for hurling large objects great distances; a four-metre-long "Shock Wave Cannon" that can shatter glass at 30 metres; "Fluorescent Tube Gun" which can fire fluoro-tubes from eight barrels at 350 kph; along with a large assortment of smaller mechanical beasts which similarly rip, tear, gouge, smash, shatter, burn, cough, splutter, fume and explode in amusing and unpredictable ways.

Recent shows have featured the world's largest Tesla Coil, a V-1 rocket engine built from scratch and based on old Nazi designs, and a "supersonic" propeller built with advice from personnel from the U.S. space agency NASA. SRL has also started to venture into higher-tech territory with computers for programming some of the machines, experiments with laser technology, and more sophisticated remote-control devices.

Along with the alternative publication of extremist arts, *Re/Search*, and other subcultural and mainstream media coverage, a significant part of SRL's reputation can be attributed to the video documentation of its shows. Leslie Gladsjo took over this responsibility in 1988, and has made a number of documentaries, whose subjects include Kathy Acker, Karen Finley and Modern Primitives. Combining footage of performances, interviews with audience members, and commentary by SRL personnel, her work captures the sense of urgency and danger that is a central feature of SRL's shows. The videos are now distributed by Warners and a more interactive CD-ROM version of material covering most of their early shows is currently in production.

To give some idea of the sheer perversity and power of an SRL performance, the noise from a recent show at the Straße Hoerchst Festival in Graz, Austria, so alarmed hundreds of local residents who were unaware of the show that they called the emergency services, the police, the army and the mayor. A mere 50 km from the border of the former Yugoslavia, the Austrians thought that they were being attacked by Serbs. Even the Austrian Minister of Defence had trouble believing the police that it was only an art performance. While the Austrian army readied itself for war, the Defence Minister sent 20 police officers to the performance with decibel meters and other inscription devices to record the sound levels from the show. They recorded 108 decibels one hundred metres away. The

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local newspaper later accused SRL of giving the city and the military a terrible case of *Kriegsangst*, or "War Fear". Pauline judged the show a huge success.

Republican arch-conservative Pat Buchanan has labelled SRL's antics "an outrage". More moderate individuals may reflect that SRL's activities highlight our subliminal awareness of the constant threat of attack and disaster, as well as our society's ongoing preparedness for war. The desire for a peaceful world has difficulty acknowledging the dark side of human nature: the violence and aggression which some call the "survival instinct", others "the will to power". It could be argued that our failure to acknowledge the human potential for violence, mass murder and destruction is symptomatic of our failure to recognise the insidious social processes which make such senseless disasters possible.

The artistic precursors to SRL's mechanical performances further undermine some of the more negative responses to their work. The mechanical theatre developed by European avant-garde artists' groups of the early 20th century such as the Constructivists and Futurists, as well as by Dada and Bauhaus artists, utilised pseudo-robots, puppets made of machine parts and abstract mechanical imagery. However, even though Constructivism, Futurism and Bauhaus embraced a kind of technological utopianism, SRL's work owes more to the anti-art nihilism of Dada. Its work is frequently compared to the work of the Neo-Dadaists of the late 1950s and '60s, particularly Jean Tinguely, whose self-destructing kinetic sculptures *Homage to New York* and *Study for the End of the World 2* aroused considerable controversy in the early 1960s. SRL's sloganeering and appropriation of popular media and corporate imagery also recalls the activities of the Parisian cultural anarchists of the 1950s and '60s, the Situationist International. SRL can also be seen as a dynamic realisation of Paul Virilio's proposition for a Museum of Accidents, dedicated to the unrealised dreams, unintentional mistakes and appalling tragedies of modern technology. In a more contemporary vein, the collective organisation and efforts of SRL resemble similar principles underlying international performance groups such as the Mutoid Waste Company, Archaos and La Fura del Baus, as well as fledgling Australian groups such as Splinters, Triclops International and the Post Arrivalists.

The SRL headquarters lies in the Mission district of San Francisco. Its workshop-cum-home nestles between the interstate freeway on one side and parkland on the other, at one end of what was one of the area's main industrial streets. Within five minutes of leaving the car at the opposite end of the site to SRL's workshop, someone had mutilated the driver's door lock. As Pauline had warned, the place was full of crackheads and nutcases.

Ten minutes later, Pauline was showing 21•C one of SRL's latest creations: a force-feedback attachable mechanical arm-frame and glove which remote-controlled a three-metre-long mechanical arm with a large and brutal-looking pincer for a hand. Movement of the wearer's arm and hand would be mimicked by the mechanical arm and pincers. Australian performance artist Stelarc has used similar technology in performance in recent years. Stelarc's design and performance are perhaps a little more elegant, but the principle is the same.

Pauline displayed his dexterity by picking up a hefty chunk of waste metal and repeatedly dropping it disconcertingly close to our feet. A small but appreciative crew of SRL regular and guest workers gathered for the impromptu performance. When everyone had had enough of that, Pauline showed off the workshop and explained where some of the equipment had come from. A lot of it was ex-navy from the 1940s and '50s, some of it was donated, scavenged, bought or adapted. There are metal lathes, drill presses, oxy-acetylene and other welding gear, electric saws, and shelves from floor to ceiling stacked with a multiplicity of parts and tools. In the middle of the workshop are most of the sleeping and eating amenities.

SRL's work can be ugly, nasty and brutal, but it can also be uplifting, awesome and liberating.

Pauline's bedroom features an enormous poster of J.G. Ballard, one of a constellation of Pauline's literary heroes which includes Thomas Pynchon, William S. Burroughs, Marguerite Duras, Raymond Roussel and Le Comte de Lautreamont. Bruce Sterling and William T. Vollmann are, in turn, fans of Pauline and SRL. Vollmann's novel, *The Rainbow Stories*, features a chapter on SRL and its work.

At the far end of the workshop most of the machines are stored, either fully or partially disassembled. A few months after we left, Pauline was moving some of them with a crane and a stack fell on top of him, leaving a massive gash in his lower left leg. Although there are safety signs throughout the workshop, accidents still happen and the worst seem to happen to him.

In 1982, Pauline lost most of the fingers on his right hand while experimenting with rocket fuel. He had two of his toes grafted onto his hand so he can still use it for holding things. Although there is the temptation to describe this exchange of body parts as Frankensteinian, it's hard not to admire Pauline for his stoicism and determination. In an article from *The New York Times* in 1988, he explained the sense of invulnerability he had before the accident. "When I examined the situation, I realised I was just another white male who had lived a life of privilege. Nothing bad had ever happened to me, and I'd gotten a sense of hubris. It becomes destructive when you think you can do anything and get away with it."

Just the same, Pauline is obviously pleased that other people find his unhealthy obsessions attractive. "I'm interested in intense things and I'm interested in taking things as far as they can possibly go, within the limitations of physics on the one hand, and the limitations of human beings on the other.

"I think that is a function of the way I've always tried to present SRL as an open-ended system. It's not like there is any dogma that is being perpetrated in the show. We create a very weird set of circumstances that can be interpreted in an awful lot of different ways. To me, the world is just one big grey area, and that's what I like to see presented in the shows. I don't see why we should shy away from presenting things because people won't like it. The same things that attract some people really repel certain other people. Fortunately for me and my conscience, the kind of people who don't like what goes on in an SRL performance are the kind of people who I just don't care that much for either."

Pauline says SRL grew out of his disappointment at the lack of opportunities for self-fulfilment in the fields in which he'd been trained – mechanical engineering and fine art.

"I wanted to develop something that would encompass all that. I wanted to develop an organisation because I thought that the things I had to do would be difficult and controversial. I liked the way that corporations hide behind this facade of blamelessness. You can never pin down who's to blame or who's in charge. Somebody had seen the things I'd been doing, the billboard stuff and such, and they had a magazine called *Boulevarde*. They said, 'Here, you can have a full page in my magazine to do whatever you want.' So I said, 'Well, okay.' I thought I'd make an ad for what I do, but what am I going to call it? So I just lifted a name from this *Soldier of Fortune* magazine, this disreputable company that was called Survival Research Laboratories, a sort of right-wing military re-sales outlet. They only appeared in this one magazine, and the circumstances surrounding this organisation remain unclear, but I've had no problem from them."

The resonances of SRL's work with the more anarchic tendencies of modern art and popular culture are complex and fascinating. In an article on SRL from art journal *Parkett*, Mike Kelley describes SRL's relationship with popular spectacles such as hot-rodding, drag-meets, demolition derbies, truck-pulls and Heavy Metal concerts. Kelley cites Georges Bataille and his recognition of "the necessity for a division between the economic and political organisation of society on one hand, and on the other, an anti-religious and asocial organisation having as its goal orgiastic participation in different forms of destruction". The mirror of conspicuous consumption is mass destruction; the muzak and cheerful ditties that SRL plays before its shows focus attention on the cliched "happiness" that is about to be destroyed in the mock horror of a mechanical apocalypse.

Bataille's observation fails to distinguish, however, between the ritualistic simulation and the brutal reality of destruction, a distinction which also seems to escape many of SRL's critics. Festivals which incorporate simulations of torture, death and rebirth persist to this day in Italy, Spain, Mexico, the Philippines and Indonesia. Such events attempt to expend and pacify the violent and destructive aspects of the Divine. They refer to profound mysteries relating to initiation and the transformation of the spirit through the subjection of the body to magical reconstruction. Such affirmative and cathartic rituals may be too raw and primitive for the modern Western sensibility to accept as valid, but they are, nevertheless, a relatively harmless outlet for such aggressive energies, in contrast to the collective indulgence of fear, hatred and intolerance expressed in war and other forms of mass psychosis. SRL's work can be ugly, nasty and brutal, but it can also be uplifting, awesome and liberating.

Gladsjo describes the varied responses to their shows: "You can be interested in it as satire, or as technology, or as violent spectacle. There's just about a million different reasons why people like it or why people don't like it. The people who are really negative after a show and don't like it, who maybe got dragged there by their friends, they always have different reasons too. Some people may think it's too violent or other people might think that it's not violent enough, or that they heard some other hype and were disappointed they weren't killed. There are a hundred reasons why people don't like it too."

Nevertheless the predominant accusations of warmongering and "toys for boys" persist. Pauline accepts that the latter criticism may have some basis, "But I think that also a lot of women don't look at it that way, but rather see it as a place where they can get themselves in touch with things that are taboo for women, things like very powerful devices, big huge tools, things that they've been denied as women. Women are told that they shouldn't be interested in these intense things that are aggressive and connected to male things. They're told these things are bad for them and not the right and proper thing for a nice young girl to be involved with. I don't think there's anything wrong with believing that, but I know there are other women that don't feel that way and I tend to sympathise with those women more, I guess."

Gladsjo agrees: "There are a lot of women who work with us. I find when I interview women who are working on machines who possibly had no technical skills and felt that this was something they couldn't do, have found that when they work on these things they get a thrill from using that stuff and find it very satisfying.

American women are just as obsessed with violence as American men. I can understand women not liking it for other reasons, but disliking it because they think it's a male thing is maybe a way of excusing their fear of that sort of stuff," she says.

Although SRL recently staged a performance in San Francisco, entitled "A Calculated Forecast of Ultimate Doom: Sickening Episodes of Widespread Devastation Accompanied by Sensations of Pleasurable Excitement", sponsored by the hip computer-mag *Wired*, this was the first major show that SRL had done in the U.S. for five years. When asked why this was the case, Pauline was philosophical. "Well, it's difficult because of the economy. It's become like a 'no-frills' economy, a rationalised economy, where unless it's going to generate money or something more tangible, then people don't really jump at it. Like, they wouldn't jump at it because it's exciting! You could look at the phenomenon of something like raves as a business thing where you give people the bare minimum. You don't even pay bands. You have this recorded music and then you charge people as much money as you can and get people high so that they don't notice the difference. It's like a virtual entertainment that requires very little outlay and you get a lot more income back. So you're competing against that. The artists' organisations that supported us were really damaged by the flak from the NEA [funding restrictions were made by the U.S. National Endowment for the Arts in response to Republican outrage at the pornographic "excesses" of contemporary art]. A lot of small non-profit groups really got their budgets slashed. Then the liabilities situation has continued to deteriorate in the USA, so that it's very difficult to get insurance. It's becoming more expensive and the insurance really doesn't protect you any more either."

Gladsjo adds that this situation isn't true just for artists, but for practically anyone who tries to do anything new and innovative. Pauline says that makes people feel very apprehensive about continuing to support SRL. "I've never tried to hide the approach we have to doing these shows. It's a very malicious kind of humour sometimes and I've never tried to hide that or not to say it. I admit that it's always a co-conspiracy between SRL and whoever is involved with the production of the show. I don't believe in being sneaky. Really, if someone wants to work with us then they're going to be in for the ride; the ride of their lives if they're lucky and we're lucky.

"After a while, people really start to believe in the hype of it all instead of just accepting that it's a funny thing that people are doing and that we're really not out there hurting other people. It's just a make-believe thing, a weird fantasy that's been created. Some people just look at it in terms of the hype, that we are these fearsome horrible people who are perpetrating these acts. We hear all kinds of things flying around, so I shudder to think if that's what people are hearing in the street. What about people who work for arts organisations or companies?

"I think there's a feeling in America now that the national sense of humour has been severely diminished by the way the economy's going right now. People are just looking to cover their asses and not really looking to the future because that's so uncertain and maybe even more of a problem," Pauline says.

Fortunately SRL is self-sufficient enough that this is not a crushing blow, but it is more difficult to get shows. "We've managed very well in just leaving the country to do the shows. We've got lean and mean like all the companies are trying to do now in order to survive. In the circumstances, I think we've done very well." ■

SRL recently staged a performance in San Francisco entitled "A Calculated Forecast of Ultimate Doom: Sickening Episodes of Widespread Devastation Accompanied by Sensations of Pleasurable Excitement"

I, ROD

He is brilliant, original and frustrated – and has a large army of tiny robots at his disposal. But the creator of Ghenghis, Attila and Cog, who left Australia to conquer the world, is now trapped in a NASA transit lounge waiting for his ultimate ticket to ride – landing his robots on Mars.

FLY

by Mark Kestigian

ONE CHARACTERISTIC LACKING FROM MANY PRACTITIONERS OF A.I.-ROBOTICS IS INTELLIGENCE. AT LEAST THAT'S HOW ONE OF THE FIELD'S LEADING EXPONENTS – RODNEY BROOKS, THE SELF-STYLED 'BAD BOY OF ROBOTICS' – SEES IT.

Well, maybe lacking intelligence is a little strong 'Cognitively challenged' might be more politically correct when describing why so much in this field benefits scrap metal merchants and nobody else.

Brooks has never come right out and said that he thinks other A.I.-roboticists are stupid mind you, but it's clear that he firmly believes many members of the elite fraternity suffer from, for lack of a better term, a Dr Frankenstein complex. Basically, A.I.-roboticists are hell-bent on creating robots in human image from top to toe, or thinking in terms of one-offs that are costly and most of all, BIG

Brooks' disdain for conventional robotics developed early. Studying at California's Stanford University in the late 1970s, he shared lab space with another young wannabe roboticist, Hans Moravec who built the CART, one of the world's most talked about robots. The only thing was, while the CART's computer moved at the speed of light, the robot took several hours to get up the nerve to move across a room.

"I didn't think that was too good. I mean, the world doesn't move that slowly. So when I built mine, I wanted them to look like they belonged in the real world," says Brooks.

Which brings us to Brooks' next lament with many other roboticists – that they try to control the robot's environment rather than make them fit into the real world.

The word 'real' crops up a lot when talking to Brooks. He's all about building 'real' robots that move in 'real' time.

But during a recent visit to Brooks' office at MIT in Cambridge, Massachusetts, he seemed real preoccupied. It seemed like the last thing he wanted to talk about was why the work of so many roboticists winds up on the scrap heap, or how his work was going, or why some journalist from Australia flew 12,000 miles to talk to him.

Brooks brought more to his work than just an intimate understanding of A.I. and robotics. He believed that in order to be successful, one needed a firm understanding of ethology, psychophysics, sociology, neurobiology and bugs. That's right, insect behaviour.

It could have been the oppressive humidity that had descended over the northeast. It could have been the international A.I. conference in Boston which Brooks was helping organise. Or it could have been that after finally receiving approval for funding from NASA (the Holy Grail for ever-needy scientists scrounging for research dollars) came word that dramatic cut-backs to the space program were imminent.

Whatever the reason, Brooks was in no mood for chit-chat. This seemed strange given the demeanour that came through in the dozens of articles that have appeared on him in American magazines. He was a reporter's dream: approachable, affable, quotable and, best of all, controversial. The articles portrayed a guy that was full of chit – and chat. There were plenty of great moments, but to appreciate them, one needs to understand a little about where the fields of A.I. and robotics have been; the theories that shaped much of the research and, in turn, the robots that were created.

BRAIN POWER PERFORMANCE PUSHED MOST PRACTITIONERS. To build a better robot, you had to get the head right and the rest would follow. A Cray supercomputer with legs fit the bill, so long as the mainframe could squeeze through a doorway and be softened to look more, well, human.

The rationale for this sort of look was both logical (it kept with the prevailing theories of the day) and, more importantly, ruthlessly practical because there weren't many would-be bankrollers who wanted to back some artificial being that didn't look like one of us. But as Brooks learnt from his roommate Moravec in the early '80s, you could build the biggest robot in the world and give it ziga-bytes of brain power, but if it couldn't do something as simple as shuffling a few feet without 'thinking' about it for a long time, what was the point?

Undeterred by the CART's sloth-like gait, other researchers continued to create similar creatures, but at least they could move faster than Moravec's. Some could whip anyone in chess or play the piano better than Beethoven. Impressive, but that's all they could do. They were one-dimensional creations that had more in common with creatures on a Disneyland ride than interactive computers that could walk, talk and, at the very least, match wits with a new-born baby.

Enter Rodney Brooks. An undergraduate at Flinders University in South Australia, Brooks swept through the best and the brightest A.I.-robotics centres America had to offer – Stanford, MIT and Carnegie-Mellon – before settling at MIT in the mid-'80s, turning conventional A.I-robotics wisdom upside-down as he went.

Brooks felt that rather than start with the robotic brain, you had to get it right from the bottom up, focusing on physical systems that could carry out tasks in the real world. Any changes in the robot's environment, Brooks theorised, and its computer-chipped brain would turn to mush.

The logic fit perfectly into MIT philosophy. "One of the driving tenets of our research at MIT," Brooks says, "is that we must build complete systems that exist in the real world with all its noise."

He labels this behaviour "embodiment", because the robots have bodies and experience the world directly. Their actions are part of a dynamic interaction with the world, and the actions have immediate feedback on the robots' own sensations. Brooks said that Moravec's robot, for instance, became fatally confused by its own shadow because it could not figure out why it changed as the day wore on.

To Brooks, there wasn't much use in building a robot that was not only afraid of its own shadow, but could be rendered immobile by it.

Brooks brought more to his work than just an intimate understanding of A.I. and robotics. He believed that in order to be successful, one needed a firm understanding of ethology, psychophysics, sociology, neurobiology and bugs. That's right, insect behaviour.

"It seemed to me that insects have very slow computers with just a few hundred thousand neurons, and yet they get around in the real world without much fuss," Brooks says.

Instead of worrying about the robot's ability to process information, Brooks focused on the creation's reflexive skills. Rather than give his robot enough hardware capacity to determine if the object in front of it was animal, mineral or vegetable, Brooks programmed his early creations to simply "avoid stuff".

This one simple change led to another quantum leap in the way his robots would see things. In the past, the theory was you had to provide the robot with a model of the world in order for it to know what and where things would be found. With Brooks' new approach, he just had to tell his machine where stuff wasn't found.

One of his early creations, 'Genghis', was a foot-long robot cockroach. It successfully moved ahead over any type of terrain thanks to its 12 motors, 12 force sensors, six pyro-electric sensors, one inclinometer and two whiskers. There were other artificial offspring: 'Herbert', who grabbed soft-drink cans off desks; 'Seymour', who tracked human body heat; and 'Toto', who ambled about the hallways keeping track of where he was.

Other more able-embodied creations soon followed. 'Polly', for instance, stood about 18 inches tall and could provide visitors with guided tours of the MIT A.I.-robotics labs. She simply searched the halls until she found a vertical object. She would then stop in front of the object and ask if it wanted a tour. She accomplished this feat by asking the object to wiggle a foot. Obviously, if the vertical object Polly encountered was inanimate, her floor-level sensors would not receive any response and she would simply move on until she found a more willing subject.

Brooks and his team filled Polly's 'head' with a topological map of the building's eighth floor so she could start the tour from any point and finish at the same spot. At some point during the tour, however, Polly pokes fun at her own intellectual limitations by pointing out that, "I don't understand anything I'm saying to you."

In addition to his bug-based robots, Brooks also annoyed many fellow practitioners by the sheer volume of creations his team made. Traditionalists believed you take many months, even years, to produce one large operating system. Brooks and his associates built Genghis in 12 weeks. More than 100 robots have been churned off the assembly line at the MIT A.I.-robotics lab. So many, in fact, that Brooks & Co published a book on how to build robots.

There was a downside to Brooks' frenetic robot-building approach. Indeed, the motto at MIT's A.I.-robotics lab is "fast, cheap and out of control", which could explain why Brooks' creations were frowned on for so long by giant grant-givers like NASA.

"When I first started going to them in the late 1980s, NASA didn't want to believe that humans acted like insects," Brooks says. "I told them my group could build a lot of these robots quickly and cheaply, which they also didn't want to hear. They were in to building one-off, very costly machines."

Brooks went away and began building all sorts of robots. He built so many robots that they took over another floor of the A.I. laboratory at MIT – complete with large enclosed sandbox that Brooks calls his "field of dreams". "Build it and NASA money will come," he prophesied.

NASA money did come. NASA scientists are busy building a Brooks-based robot for a 1996 Mars probe – designed to ramble through the Martian landscape collecting samples and relaying information – though recent reports coming out of Washington during our interview suggested that the space agency was facing dramatic funding cuts. Could it prevent Brooks' baby from going to Mars? Possibly, which no doubt figured prominently in his dour demeanour during our meeting.

Like his earlier cockroach creations that kept moving forward, Brooks and his energetic companions have several other irons in the fire. One new system is so small, (about one-fifth of a millimetre in diameter) that it will be used in colon research. Brooks calls it the "Up Your Bum" robot. Other systems will also look at ways to provide access to highly difficult or harmful places, like inside nuclear reactors or atop shaky bridges.

The centre-piece of Brooks' program, ironically enough, hinges on the development of a robot called 'Cog' (for cognition), that will look more like Aunt Bea than a queen bee or giant ant. Detractors could argue that Brooks has finally seen the light and realised that benefactors don't want bugs, regardless of how capable they are. They want androids they can associate with, no matter how remotely. For Brooks, however, Cog represents a natural progression from his past efforts and is expected to interact with humans in a human-like way.

Though it will not be outfitted with wheels, legs or other forms of locomotion, Cog will have a head complete with sets of microphones and video cameras that mimic human hearing and sight. The head will not have a brain on board. It will be located in an adjoining room that Cog will be able to point to if it so chooses, because its body will have arms, hands and fingers, as well as the ability to swivel on its metallic torso.

Cog represents one of the boldest brainchilds in the field. Forget about building insects that successfully navigate their way around busy hallways. Forget about giving a robot the ability to conduct tours, pick up cans, play unbeatable chess or bang out Chopin interminably. We're talking about getting a robot to think on its feet, well, on its metallic chassis anyway, and even more fundamentally, learn and retain information in much the same way children do.

This five-year experiment is still in its infancy and there's much work to be done before Cog is fully functional. The fact that Brooks and his followers can even attempt it, however, reflects not only the amount of knowledge they've picked up through previous experiments, but their ability to harness massive amounts of computing power in a parallel processing configuration.

This parallel processing system dovetails nicely with Brooks' own belief in the way the human brain stores information, not in a neat, organised fashion, but in a collection of warehouses that may be based on acquired knowledge, sight, sound and touch. Ironically, Cog will not be deemed a wild success if it can do one or two activities really well. We don't need another Elvis imitator who doubles as the ultimate tour guide.

Cog would be a success if after five years, it can behave like a two year old. It may not sound like much to outsiders, but in A.I.-robotics circles, it would put Brooks at the top of the heap ■

Attila the Hunk:

Brooks' robot —utilising a complex network of motors, force sensors, inclometers and pyroelectric detectors — can crawl over any terrain, outperforming its larger, clumsier and slower-moving cybernetic cousins.

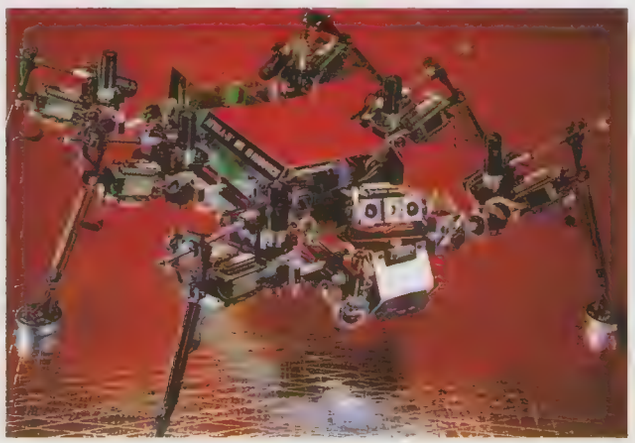


PHOTO: DAN WAGNER

NOBEL SAVAGE

After unlocking the secrets of DNA, prize-winning biochemist Kary Mullis traded in his centrifuge for a life of wine, women and surf. Besides, babes really dig a Nobel.

by Emily Yoffe

Kary B. Mullis sits in his beachfront apartment in La Jolla, surrounded by his tools of seduction. There are bottles of wine, surfboards, a guitar ("Women go crazy when you play the guitar for them"), and the most potent and rare of his offerings: a newly minted medal the size of his palm, his very own Nobel Prize. He won it for chemistry in 1993 by looking at how life reproduces itself, and coming up with something more efficient. This is, perhaps, the perfect invention from a currently unemployed surfer who seems intent on reproducing himself with every woman he meets.

He no longer has to chase women; they pursue him. They send 8-by-10 glossies, they write letters, they leave longing messages on his answering machine. They are simply acting out a desire coded deep within the species: to mate with someone of superior genes. Since Mullis understands our genetic mechanisms so well, the attention hardly surprises him. "Why wouldn't they?" he asks, then offers a self-description. "I'm 49 and I act a lot younger than I am. Someone who roller-skates and surfs and does science and writes and plays guitar and sings, he can't be all bad." He leaves out a few attributes. He also has a well-muscled build, a strong, sun-etched face, clear turquoise eyes, and greyish hair he constantly musses in a boyish gesture.

Mullis does his best to convince me that he is the happiest man in America. For one thing, there's money. Since 1993 he has been awarded almost US$1 million in prizes – the US$450,000 Japan prize, the country's supreme scientific honour, and his US$412,500 share of the Nobel, which he split with Canadian chemist Michael Smith, who won for another invention – which means he no longer has to cobble together a living as a biotechnology consultant. For another, there's fame. An entire *Nightline* was recently devoted to a reverential profile of him. And the recognition comes after years of what he considered intolerable mistreatment by former colleagues. And then there are women. But even better, he is not in the middle of a divorce (there have been three) or a painful romantic breakup. Mullis has achieved the kind of freedom very few people ever experience: the utter absence of obligation. So he recently decided he is finished with science and will now pursue his long-delayed dream of becoming a writer.

But the quality he radiates is not contentment; it is recklessness. He has never been good at controlling his impulses, and now that he has been anointed one of the most superior people on the planet, he doesn't see any reason he should. Mullis has always done everything with the same superhuman intensity. That he lives only in the extreme is

King meets Big Kahuna: Kary Mullis accepts the 1993 Nobel Prize for Chemistry from The King of Sweden at a ceremony in Stockholm. "He doesn't fit the normal mould of a Nobel Prize winner," said a colleague who doubted Mullis' chances before the announcement.

perhaps what allowed him to look beyond conventional scientific truth and find a way to reset the mechanisms of life. But the cost of behaving outside the boundaries has been high. "As a father, he's more like Jim Morrison than Fred MacMurray," observes his 16-year-old son, Christopher, one of three children by two of his former wives.

Mullis walked out of the company where he did the work that earned him his Nobel Prize, leaving shattered friendships and a legacy of personal bitterness toward the profession that has brought him glory. Now, with none of the quotidian concerns of life to blunt his impulses, some people close to Mullis are worried that this peak moment of his existence could also be the most precarious. The danger, friends warn, is that he has never been faced with so many choices or temptations. As Mullis himself says, "I actually can't stop myself from being myself".

HE CHANGED THE WORLD LATE ONE FRIDAY NIGHT AT MILE MARKER 46 7 on Highway 128 heading toward Mendocino, California. It was the spring of 1983, and Mullis, then a chemist with the biotech company Cetus, was driving toward his weekend cabin with his girlfriend, Jennifer, also a Cetus chemist. At Cetus, Mullis was responsible for making the pieces of DNA used by the company's molecular biologists for their experiments. When Mullis joined Cetus, the laboratory process for reproducing DNA was laborious, slow, and prone to error, something like book production before the invention of movable type.

Mullis says he does some of his best thinking while driving, and on this particular day he had plenty of time to think. His relationship with Jennifer was falling apart, and rather than speak to him, she slept during the long ride. To take his mind off the woman beside him he knew he was losing, he began imagining ways to unravel and reconnect DNA's double helix. And then, in a flash, he suddenly saw a way to solve the most vexing problems of DNA chemistry – discrimination and abundance. That is, he came up with a method to identify the most minute fragment of DNA and then reproduce it virtually an infinite number of times. "Somehow I thought it had to be an illusion," he said at his Nobel Prize lecture. "Otherwise, it would change DNA chemistry forever. Otherwise, it would make me famous."

It was no illusion. It was the kind of leap that was quantum yet obvious. Once it became public, Mullis has written, it left some of the finest minds in molecular biology wondering, "Why didn't I think of that?" The process is a simple one. First the strands of DNA to be reproduced are separated by heat. Then they are tagged with primers – short strands of DNA – that signal a naturally occurring enzyme, DNA polymerase, to start making copies. The power of the technique, called polymerase chain reaction, or PCR, comes from the fact that the process can be repeated in an endless cycle. The desktop-size machine that today performs PCR can produce one hundred billion copies of a desired gene in a few hours.

PCR became U.S. Patent 4,683,202, and already it has changed the fields of diagnostics, forensics and anthropology. PCR can find the HIV virus lurking in a cell before the immune system has produced any antibodies for it. It can identify a criminal from a single molecule of his DNA left at a crime site. It has spawned a new field, molecular archaeology. Now, by using PCR to replicate the DNA of long extinct creatures, evolution can be observed in the act. Without PCR, Michael Crichton probably couldn't have envisioned *Jurassic Park*. With PCR we can find out if our cells are concealing the earliest stages of cancer. And researchers say that PCR could ultimately allow us to determine if our cells will one day harbour cancer.

"I thought the method cells use to reproduce their DNA was fairly tedious," Mullis says. But he was not motivated purely be the desire to revolutionise molecular biology. He also wanted Jennifer to fall in love with him again. "I loved to perform for Jennifer," he says. "There is some truth to the concept of the muse."

As dazzlingly simple as Mullis' brainstorm was, making the concept viable required months of slogging lab work. He had to invent procedures, find the optimum temperatures, identify the proper re-agents. Although his bosses took him off his regular duties so he could concentrate full-time on PCR, Mullis was increasingly resentful that hardly anyone seemed to see the potential of what he was doing.

"One or two technicians were interested, and on the days when she still loved me, Jennifer thought it might work", he said at his Nobel Prize lecture. "On the increasingly numerous days when she hated me, my ideas and I suffered her scorn together." It was four months before his first successful experiment, and by then Jennifer had walked out on him.

On the evening of December 16, 1983, Mullis examined his purple-topped test tubes and saw for the first time that his idea actually worked. He told his lab assistant, Fred Faloona, that they had just changed the rules of molecular biology – and it hardly seemed to matter.

"I was sagging as I walked out to my little silver Honda Civic," he told the Swedes. "Neither Fred, empty Beck's bottles, nor the sweet smell of the dawn of the age of PCR could replace Jenny. I was lonesome."

And it is the breakup, not the professional triumph, that obsesses him even now, a decade later. In the middle of a long account about his glory days in Sweden, he is suddenly moved to retrieve a photo album devoted to Jennifer. "We had very, very wonderful sex," he says as he flips the pages. "She was aggressive in a way women usually aren't." Of all of his wives, and his lovers, he can't get over the fact that Jennifer is the only one who neglected to congratulate him when he won the prize. "We didn't even part the same species," he says.

It doesn't take a Nobel Prize winner to tell you that genius and gentility don't always share the same chromosome. While Mullis can be utterly charming, funny, full of unexpected observations, he seems to derive great pleasure from watching people respond to his boorishness.

He is sitting at home over a lunch of pizza and red wine, trying to tell of his adventures in Stockholm, but it's impossible to keep the tale on track. Mullis does not have conversations; he holds forth, spewing opinions like a whale clearing its blowhole. In an afternoon he can traipse through an explanation of how *Homo sapiens* became social creatures, to why Lavoisier, the father of chemistry, lost his head during the French Revolution, to the malign nature of the Catholic Church.

The apartment is a small, sunny place, so close to the ocean that the breaking surf is a counterpoint to Mullis' monologue. There is a sense of contained anarchy in his living quarters. Next to the dining alcove is a stack of about 15 microcassettes. He doesn't have time to keep up with his phone calls, so when his answering machine is full, he simply throws the tape on the pile without listening to it. I have him play one cassette. There are voices from Japan, India, all over the United States, asking him to bestow enlightenment upon them.

Behind Mullis is the refrigerator, its door covered with photographs. The largest features his entourage from the Nobel ceremony: his third ex-wife, their two sons, one of his current girlfriends, his mother, two of his brothers and their wives, and two boyhood friends. There are numerous other snapshots, four or five of them women in various stages of undress. He is obviously partial to slim blondes.

He says it has been about five years since he's had a serious relationship – these, for him, usually last two or three years. He says he misses it, but he doesn't know if he can bear the pain of another failure. "It's getting to be such an overwhelming bunch of tragedy. I'm afraid to take on a new lover because any more tragedy may kill me."

At 3.30, the bottle of wine finished – I have had two glasses – he takes out a bottle of margarita mix. He pours it into a glass and tops it with a generous splash of gin.

"Now, don't write me up as an alcoholic," he says.

"Are you?" I ask.

"I like drinking. I enjoy the feeling of it. If I fuck up a little bit, it's okay. This is a party day. I don't have anything on my schedule that requires me to be sober."

We leave the apartment to pick up more wine for the poker game to be held that evening. Back at his dining-room table, Mullis opens one of the new bottles and has two glasses.

Then he grabs the back of my neck hard and pulls my face toward him. I manage to turn my head just in time to avoid his lips. I tell him not to do that.

"Why not?" he says, "I like you." Which for him is sufficient cause.

I explain that I'm here for professional, not personal, reasons.

He seems baffled. "But we've opened ourselves up to each other," he says.

I tell him my job is to draw him out.

"Oh," he says, and nods his head.

We continue talking about Sweden, but in a few minutes his hand is on my thigh.

"Cut it out. I mean it," I say.

"You're telling me I can't touch you?" he asks in what seems true astonishment. Then he tells me he wants to sleep with me. "You're missing your chance to really know me," he says. "How can you say you know me without sleeping with me?"

I tell him it will just have to be a flaw in my understanding.

Mullis says he does some of his best thinking while driving, and on this particular day he had plenty of time to think... he began imagining ways to unravel and reconnect DNA's double helix. And then, in a flash, he suddenly saw a way to solve the most vexing problems of DNA chemistry – discrimination and abundance.

He grew up playing with dynamite. He was raised in Columbia, South Carolina, the second of four sons of a salesman father and a real estate broker mother. His parents divorced when Kary was in college. The boys spent most of their early years exploring the woods near their house or the nearby network of storm drains. When he got a little older he became interested in science. "You could make all kinds of stuff if you knew how to deal with matter."

In his case, the matter was homemade rocket fuel. "I could get potassium nitrate at the drugstore and sugar from my mother's kitchen. I had a brother who was willing to be there in case I got blown up," Mullis says. On one occasion, he says, a rocket exploded on its launch pad, and he was saved from early extinction by the slow-burning fuse that had given him time to run to safety.

His interest in the nature of things took him to Georgia Tech. While there, he married for the first time. "I got married to my first wife when she was pregnant. It was a loving experience. We were both about 20. We have a daughter who is 29." Mullis had a scholarship, and he and a friend started a small chemical manufacturing company. From Georgia Tech, Mullis went to Berkeley for his doctorate.

It was the '60s, and Berkeley was where the '60s were being invented. While pursuing a degree in biochemistry, Mullis experimented with his own biology – discovering a new sexual freedom. "It wasn't a good place to be married," he says of those days in Berkeley. He also fiddled with his own chemistry, ingesting various psychedelic substances. But he was serious about his work. "I realised what science was, strangely enough, at Berkeley," he says. "At Georgia Tech I don't think I knew how it differed from technology. It's a philosophical kind of an issue."

Though Mullis was a driven man, he never had a clear career goal. He liked to explore what captivated him. "I don't think he is dedicated to science in the same way a lot of people are," says his first wife, Richards Haley, now remarried and raising three sons. "If he was interested in something he went for it. He's very compulsive." She adds that he brings the same quality to a woman who captures his imagination. "If you're the object of his attention, it's very exciting."

This intensity is perhaps Mullis' essential quality. "I don't do things that people ask me to do, usually," he says. "I think that's a flaw in my character that's probably served me well." How? "You don't get the Nobel Prize for doing what other people think you ought to do... I do things because they intrigue me."

As always, his sex life shaped his professional life. When his first marriage was over and he was finishing his graduate work and teaching, Mullis fell in love with a 19-year-old college student, Gail Hubbell. "Students *loved* him," she recalls. Some loved him more than others. While they were living together, Hubbell caught him cheating on her. By that time she had been accepted to medical school in Kansas City, Missouri, so she left him and moved to the Midwest.

Mullis responded with a torrent of letters begging her to take him back. "He wrote me almost every day. Tomes of passionate letters. How could you resist?" He wanted not only to patch it up but to get married. She agreed. After a ceremony in California, she returned to medical school, and he was supposed to follow. He never showed up.

"He spent our honeymoon with another woman," Hubbell says.

Hubbell finally got him on the phone, and he confessed he was having an affair with a graduate student. She told him not to come. "So of course he did," she says. They stayed together for another year.

I ask her what his problem is.

"Testosterone poisoning," she says.

During their year together Mullis decided to abandon science and take up fiction writing. It didn't work. "I didn't have enough experience," he says in a singular display of understatement. He returned to science and got a job at a medical school as a biochemist in a paediatric-cardiology unit.

He also supplemented his income by becoming a sperm donor for an artificial insemination clinic. "I fathered quite a few children in Kansas City," he says. Yet Mullis recently turned down a chance to reproduce himself on a national scale: he declined an offer from what is popularly known as the genius sperm bank. "There were so many forms to fill out that by the time I finished, I wouldn't have had the strength to masturbate in that little liquid-nitrogen cylinder."

His second marriage over, it was not long before he fell in love again, this time with a young nursing student, Cynthia Gibson.

They soon moved to Berkeley, she dropped out of nursing school, and in 1976 he convinced her to marry him. "He doesn't necessarily like to be married, but he does like to get married," says Gibson, who now works at a family grain brokerage in Missouri.

In Berkeley, Mullis had another career crisis. He decided against academia. "He was fed up with some of the things he had to go through in the academic world, the trouble it took to requisition a pencil," Gibson says. To pay the rent, the two went to work in a restaurant owned by Mullis' first wife. Gibson gave birth to two sons, and Mullis finally decided to return to science, this time taking a job in the exploding biotech industry, at Cetus.

Not long after he arrived at Cetus he met Jennifer and began an affair that caused the end of his marriage in 1981. "She was his most important girlfriend, but she was by no means the first," Gibson says. "It was significant that she worked with him. They had a chemical and biochemical connection."

Today Mullis is able to acknowledge the pain he caused by leaving Gibson, whom he says he still loves, and their two sons. He explains that he couldn't help himself: he was simply coded to be this way. "I did it because there is a certain lack of excitement to a perfect sort of woman. After a while it fails to raise your adrenalin, and you need the rush of some fiery woman who's a real bitch every now and then." He acknowledges that this need is not a universal component of the Y chromosome. "That's my experience. A lot of people don't feel that way."

Gibson has made peace with her former husband. "He's incredibly transparent," she says. "For all his boorishness and confrontational attitude, he's still a little boy. Maybe that's why it's easy to forgive him."

I ask Mullis for some phone numbers of colleagues and family members. "Not unless you sleep with me," he replies.

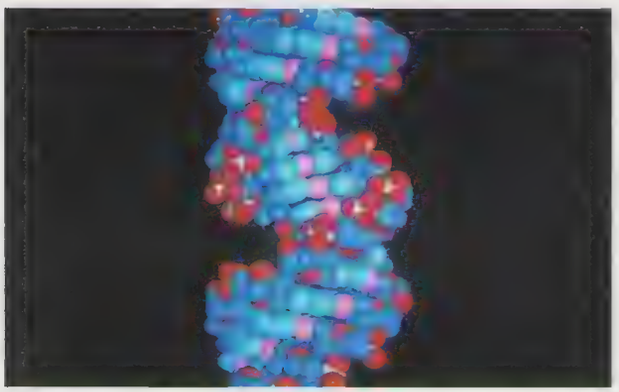
At about 7.30 people start arriving for poker, most of them younger friends who live in his apartment complex. As they come in, he introduces me alternately as his wife or someone he's involved with.

"She says she won't sleep with me."

I repeat my request for the phone numbers. Reluctantly he gets up from the dining table and goes to the other room to get them, beckoning me to follow. He stops at the doorway of his dark bedroom. "They're in there," he says. When I don't reply, he points at the bed. "You see that," he says in a low voice. "We could have such a good time on that."

On the way to the Nobel Prize, he could have lost everything. Mullis points out that his invention was a technological breakthrough, not an end in itself "PCR, on being discovered by me, did not really answer immediately any questions; it just suggested a method whereby they could be answered." The molecular biologists at Cetus immediately set to work developing diagnostic kits for AIDS and other diseases.

This should have made Mullis happy, but there was a problem. While Mullis was still working on his initial paper describing PCR, his colleagues were prolifically publishing the results of their work using PCR. Mullis had received a US$10,000 bonus for his invention, but suddenly he found that others in the company, particularly molecular biologists Henry Erlich and Randy Saiki, were being lauded in the outside world for their application of his technology. "People were inviting Saiki and Erlich to give speeches all over the world on PCR," recalls Albert Halluin, who at the time was a patent lawyer with Cetus. "And Kary was trying to figure out what in the hell happened."



DNA While U Wait: The genetic material forming the basis of all life, a strand of DNA – or Deoxyribonucleic Acid to the cognoscenti. Before Mullis, replicating DNA was a laborious process. After Mullis, the process is a simple one: now a desktop-size machine can produce one hundred billion copies of a desired gene in a few hours.

Credit for the discovery of PCR was appropriately given to Mullis, but it fell far short of what he wanted. As Mullis himself acknowledges, the power of PCR comes from applying it – and his colleagues were doing that, not he. When they published their work his name would appear on the papers as a co-author. "He felt, on anything that came out of PCR, he should get the lead," says Robert Fildes, who was then chief executive of Cetus. When that didn't happen, Fildes says, 'Kary took to getting into disputes with his colleagues and going to outside meetings saying disparaging things about them – and these were world-class scientists."

The controversy became an ever-escalating battle of wills. Mullis' superiors tried and failed to muzzle him. Finally he was called into his supervisor's office. According to Fildes, Mullis was told, "You can be part of the team or you can go." And he said, "I'm going."

"After he left, Kary was totally torched," Halluin says. "It would be wonderful for mankind if he continued on and made additional discoveries. But perhaps because of this Cetus experience, where he felt almost maligned, he's scientifically hanging it up."

Mullis briefly took a job with a San Diego biotech company. Then in 1987 he became a consultant. When he talks about that work it is clear that, as with his fear of getting hurt again in love, he is afraid to risk another professional involvement. As a consultant, he says, "You can go to a company, talk about their problems, then ride away into the sunset. But it you work for a place and you have an idea and you present it and nobody cares, you have to be there the next day, when they don't care, and the next week and the next month. You get all involved emotionally."

Of course, at Cetus they cared about PCR. It was a gold mine, and the company was inundated with potential partners wanting to extract the riches. In the end, the company sold the rights for part of the application of the technology to the Swiss firm Hoffmann-La Roche for US$300 million. It was a huge figure but worth it: today PCR-related technology is a US$1-billion-a-year industry. Cetus' decision did not leave the rejected suitors happy, and in 1989 Du Pont decided to challenge Mullis' 1987 patent. It claimed that PCR, in essence, had actually been invented in 1971 in the MIT laboratory of Nobel Prize winner H.G. Khorana, although at the time no one saw how the process could be used.

Fildes says the suit was simply a part of doing business "[Du Pont] wanted to get into the game, so you look at the patents and see if the patents and the discovery can be upheld. It happens all the time.'

But for Mullis this was not business as usual; it was a personal assault. "The lawyers for DuPont were intent on defiling the truth. They were just saying, 'Here's an angle. If we can get the jury convinced that this is what PCR is, then maybe we can get them convinced it was done before.'"

Cetus executives had more on their minds than the lawsuit – would a volatile and angry Mullis take their side in the dispute? Halluin was sent to pacify Mullis, telling him that he hadn't been treated right or received all the credit he deserved. "But his patent was the first evidence showing he was the true inventor of PCR, and if it was found invalid, he wouldn't have anything left," Halluin said. Then he offered Mullis his *coup de grâce*. "If the patent was struck down, it would be difficult or impossible to get the Nobel Prize or any of the other prizes." Mullis got on board.

Each side called as many Nobel laureates as it could muster to bolster its case, although Khorana refused to testify. On February 28, 1991, the jury completely vindicated Cetus and upheld Mullis' patent. Now all he had to do was wait for the Swedes.

It doesn't take a Nobel Prize winner to tell you that genius and gentility don't always share the same chromosone. While Mullis can be utterly charming, funny, full of unexpected observations, he seems to derive great pleasure from watching people respond to his boorishness.

I AM IN HIS OFFICE, COPYING HIS NOBEL SPEECH. SUDDENLY MULLIS appears at the door. He starts dancing around the office like a hyperactive boy who's gone off his Ritalin.

"Weren't you at Berkeley in the '60s?" he asks.

"You mean free love?"

"Yeah."

"Kary, that's over."

"No, it isn't," he says. "I know plenty of women who are still in that mood. Plenty." Then he slips up beside me and lifts up the back of the loose tunic I am wearing. I bat his hand away as he explains.

"I just wanted to see if I really wanted to sleep with you. How could I tell with that thing you're wearing?"

MULLIS NEVER HAD ANY DOUBTS THE PRIZE WOULD BE HIS. "I had been told by a lot of people that they thought I would win. It was reasonably obvious the invention had had a huge effect on things." The week before the 1993 prizes were announced, Robert Fildes was telling friends he didn't think Mullis could win. "He doesn't fit the normal mould of a Nobel Prize winner, and I know a lot of them," says Fildes. "He's a wild man. There's a certain amount of politicking involved, and I was not sure his personality and his lifestyle would have allowed him to win."

Even ex-wife Cynthia Gibson had her doubts. "In spite of the fact that he had been telling me he deserved it for quite a while, I was surprised," she says.

For Mullis the prize has become an endorsement not just of his mind but of his personality. He acts almost as if it has conferred a sort of immunity on him. Certainly he wasn't about to start curbing himself in Stockholm. Asked if her ex had behaved himself there, Gibson says with a small sigh, "I think he tried. The police came only once."

For the several speeches he had to give, Mullis had brought with him a pen-size laser to use as a pointer. In a playful mood one day, he started aiming the red dot of light at passersby below his hotel window. What he didn't know was that a year before, a sniper had been shooting random victims on Stockholm streets with a laser-sighted rifle. In short order the police were at Mullis' door. "I said, 'Do you know who I am?'" Mullis recalls, using a phrase that since the Nobel has become a favourite in his vocabulary. The matter was promptly straightened out, though Mullis had to promise to stop terrorising pedestrians.

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Mullis walked out of the company where he did the work that earned him his Nobel Prize, leaving shattered friendships and a legacy of personal bitterness toward the profession that has brought him glory.

Then there was the moment he met the king and queen. Most of the laureates simply passed through the receiving line, shook the hands of the royalty, and moved on. Not Mullis. "I told them that I had talked to a lot of people and it seemed they were very well liked and respected, but that people had a certain amount of doubt about the princess," Mullis says. "A 16-year-old princess would probably have some problems that needed a few years to work out. I had the confidence she would, and I said I would be willing to take a chance and offer my son's hand in marriage to her for a third of the kingdom.

"I thought they'd laugh, but they didn't," he says, slightly puzzled.

It didn't seem to matter. Mullis says the aide assigned to him told him the next day that he had gotten a more prestigious seating assignment for that evening's dinner. "Maybe they were trying to move me away from the princess," he muses. And his Nobel Prize lecture – the one full of boyhood antics, country music, and lost loves – was a triumph. Afterward, students (most of them beautiful blondes) rushed him, asking for his autograph.

Most Nobel laureates win the prize after years, often decades, of meticulous, painstaking work, then return to their labs with the knowledge that they will probably never match their honoured achievements. Mullis has broken that mould. He says he has several books in him; one, about his legal battle with Du Pont, is already under way. Beyond that, he plans to write and speak about the scientific fallacies that shape our social and political worlds. First of all, he wants to demolish the popular belief that scientists know what they're talking about. Grant-mongering and dogma, Mullis asserts, have replaced the quest for truth. "Science is being practised by people who are dependent on being paid for what they are going to find out," he says.

For example, Mullis thinks there is nothing fundamentally wrong with the environment – that the ozone hole and global warming will turn out to be just hot air. He also doesn't believe the HIV virus causes AIDS. "There is no good correlation between the HIV cases and the AIDS cases except that most people with AIDS have HIV. But most of the people who have AIDS have about anything you can look for, and they've got it in abundance... What I'm claiming is that AIDS isn't caused by any one virus. It is caused by a very interesting effect of a tremendous number of viruses."

Mullis and muse.

Mullis is now being courted by the Japanese. He was recently hired by Dentsu, the all-powerful Japanese advertising agency, to hawk products such as automobiles.

"The way I understand it, the young people in Japan have aspirations to be more like Americans. I'm sort of representative of that in an idealised way," he says, with a manner that suggests he finds this notion both amusing and irrefutable.

"Here's a guy who claims that he never works, and yet he does good. He has fun," Mullis says.

"They would really like to hear from somebody who says. 'You don't have to actually work so hard if you would just use your brain, and you guys have good brains.'"

The temptation to cash in on the prize, Mullis says, awaits any laureate.

"The ability to make money is open-ended. You can be on scientific boards, give lectures. [I could] make a million off it if that's what I wanted."

As excited as he is about the future, joining the cacophony of commentators and flacking for the Japanese seems a rather anticlimactic way to spend the last half of his life.

"I think if he's wasting his talent," says ex-wife Gibson, "it's not by deciding to give up science. It's by putting so much energy into his excesses."

And what does Mullis himself say to people who think someone with his talents should spend more time applying himself and less time indulging himself?

"I tell them to go to hell."

Mullis looks into the future, and he sees great things. As with most everything else, he thinks he has greater abilities in that department than the rest of us. In the late '80s he spent nine months studying intensively at a psychic institution in Berkeley.

"I took courses there, learning how to meditate and also how to heal yourself and other people in a psychic, mystical kind of way."

It is in a psychic, mystical kind of way that he wants to help humanity. It is no surprise that he has a theory, perfectly reflective of his personality, about the meaning of life and what awaits us when it's over.

"I want to rekindle in some people a feeling of their own spirit, a feeling of, hey, let's not lose hope here. Let's remember that it's all for fun, anyhow. It's just to accumulate stories.... Because we're all going to end up at the bar at the end of the universe. And the ones who tell the best stories, you'll be in the front, man." ■

15 MINUTES OF

by Rosie Cross and Suzanne Fraser

Images by VNS Matrix

THE INTERNET HAS INHERITED MANY VALUES AND CHARACTERISTICS OF WHITE MALE AMERICAN CULTURE. NOT THAT ALL THE MEMBERS OF THE NEW INFORMATION CLASS LIVE IN SILICON VALLEY OR HANG OUT AT GROOVY SAN FRANCISCO BAY AREA COFFEE SHOPS, BUT THE INFLUENCE OF ITS ORIGINAL MALE DESIGNERS MAINTAINS A STRONG PRESENCE ON THE NET DESPITE THE NEW GENERATIONS OF USERS.

Though the Net presents itself as an almost utopian society oblivious to ethnic, gender and class differences, white American males largely dominate. Currently, this dominance can make the Internet an alien space for women, the working-class or Third World users.

One of the flashpoints of this electronic cultural clash is IRC or Internet Relay Chat, a multi-line simultaneous global meeting place in which channels are created for public or private use. It's not unusual to find a party going on somewhere on these channels but leave the obvious channels such as Love, Happy, Romance or Nicecafe, and you soon discover why IRC has gained a reputation for generating an adversarial atmosphere or, alternatively, for being an enormous Virtual Pick-Up Bar. The virtual worlds of MUDs (Multi-User Dimensions), MUSEs (Multi-User Simulated Environments) and MOOs (Multi Object Orientated) are the real experiential spaces on the Internet. It is here that switching gender, developing characters, playing at being animals or mythical creatures, and creating whole new worlds have become fashionable pastimes for researchers and programmers.

Some see them as a unique opportunity to investigate the limits of gender in Western culture; to present themselves as genderless or multi-gendered beings in order to escape the strictures of sexual expectation which follow Net-users from real life into the virtual world.

But the Internet is not all fun and games.

Well-known Australian author and feminist, Dale Spender, who has been "surfing" the Internet for eight years, suggests that "almost everything we know about the real world, in terms of gender inequality and linguistic bias, can be carried over to the Internet... It may be a new medium but the same old rules apply in terms of who gets to say what for how long, and the way they express themselves. Every time I log-on, I am convinced that most of the women who I know who are using this medium choose to use male pseudonyms to avoid the problems of being female on-line. If it's not a question of harassment, it's a question of being ignored and having your ideas, contributions and suggestions put down. That's why some women in America have gotten together and formed women-only conference areas and spaces called Electronic Salons dedicated to the discussion of women-oriented topics by women."

Spender, who is now collating information for an international women's database for the publishing giant Simon & Schuster, is not alone in her concerns.

Maria Fernandez, assistant professor of art and architecture at Carnegie-Mellon University in Pittsburgh, is concerned that most discussion about the Internet and information technologies totally disregards the people of Third World countries, many of whom don't even have phone lines. The fact that many Third World women are still making computer components – poorly paid and under poor conditions – for the rich information class who can afford to buy such hardware, tends to be ignored by consumers in the West. These women are employed for their willingness to accept low wages and perhaps with a presumption of docility. Fernandez sees the relocation of U.S. computer manufacturing to Latin America (where, for instance, 75 per cent of industry in Mexico is taken up with component assembly) as helping create the myth of a clean industry. While the Internet is regarded by some as a new social 'equaliser', the fact remains that the production of the necessary components carries with it serious issues of health and safety including a connection now identified between birth defects and making silicon chips. As with many industries, the burden has fallen on women of the Third World and according to Fernandez,

FLAME

The Net is a wonderfully anonymous way to interact with other people. But, like the real world, it is also populated by rampant Y-Chromosomes bent on confrontation, derision and domination. But the backlash against Gonad the Barbarian has begun.

"we should be looking at what can be done to make it less exploitative".

Although Western women have similar access to computers as men, whole new access issues emerge once they log-on. The issue of sexism on the Net will intensify as such information technologies increasingly dominate the communication of the future.

Despite the fact that many women feel some feminist ground has been gained in the wider outside world, the Internet is still renowned for hosting a remarkably regressive attitude to sexual equality; problems faced by women in a sexist society are in fact exacerbated in cyberspace.

To understand the extent of the problem, groups such as Women and Information Scholarship, founded by Cheris Kramare and Jeanie Taylor in the U.S., are working to collate statistical information for women on-line. They are concerned that dangerous norms are being established – that male system administrators who control computer use by students in academic campuses are taking the attitude that if you can't stand the heat, get out of the network.

So what is being done to challenge this digital "blackboard jungle" backlash, and why doesn't the much talked about veil of virtual anonymity protect women and other groups from being harassed or silenced?

Despite the supposedly anonymous nature of the Net, certain signifiers of gender are often evident, a state of affairs that is very much of interest to linguists, such as Professor Susan Herring from the University of Texas, Arlington who has been researching gender differences in computer-mediated communications for years. She sees the Internet as offering a perfect laboratory for testing out assumptions and for validating aspects of her research.

"It's very easy for me to tell if it is a man or woman who may be posting a message," she says. "Of course there are exceptions and I have been fooled, but it's usually by women who have learnt to write like men.

"A great deal of the problems on the Internet come from teenage boys who waste a lot of bandwidth pretending to be women just as a joke. But a lot of the serious insults or arrogant attitudes come from male academics. These professionals, away from the confines of their equal opportunity academic dictates, are the most aggressive participants on the Net.

"This type of behaviour very often happens in women's discussion groups. Men seem to invade these areas as though their territory were being threatened. I see very little evidence that men concede to points made by women and men will very often continue flaming another person well after the point has been made. Even when a post has been made originally by a woman, the debate is taken over by one or two men who claim the topic as their own and drive other people away. I mean, an example of this happening might even be in a topic devoted to a woman's bridal frock!"

A lot of the serious insults or arrogant attitudes come from male academics. These professionals, away from the confines of their equal opportunity academic dictates, are the most aggressive participants on the Net.

In *The New Hackers' Dictionary*, Eric Raymond defines 'flaming' as an electronic message intended to insult or provoke: "to speak incessantly and/or rabidly on some relatively uninteresting subject or with a patently ridiculous attitude; directed with hostility at a particular person or people. In fact, flaming can translate into systematic on-line bullying."

The very nature of computer-mediated communications prevents actual interruption, but in its place comes endless qualification or 'virtual dissection'. "A reply to a female post, which reproduces the original message with annotations, criticisms, counter-examples, and flames after almost every line is not uncommon," says linguist Lauren Sutton. For Sutton, the Internet becomes a kind of bizarre literary criticism, like a LOUD talk-back radio show, where anything goes. CAPS indicate shouting, and lots of abuse towards females, abuse of gays/lesbians/bisexuals, and ethnic-bashing occurs. From her research, Sutton concludes that "the goal is not discussion, but dominance".

An 'anything goes' elite enclave of computer users and programmers was expected to transcend the need for old rules of relating to one another. Ironically, this is anything but the case. Although attempts have been made to institute some guidelines through the introduction of 'netiquette', these are generally ignored in favour of text-based shoot-ups. Linguists such as Herring and Sutton are quite convinced that men are using the Internet essentially to blow their own horns. "Characteristically men are self-promotional and tend to be authority-orientated; very often words used by men focus on themselves at the expense of others. Women are therefore outnumbered and shouted down," Herring concludes.

Vast amounts of discussion on IRC indulges in questions of gender, age, race or sexual preference. On one recent group discussion, dedicated to technical issues, a discussion about the way women conspire to tease men on the Net was witnessed: "... you just can't trust some of the girls who log on here. I met a girl the other day who said she was 6 foot 2, I bet she's only 5 foot 3."

What is remarkable about this not uncommon level of discussion is the way the Internet has become a global dating service for couples and a quick-fix text-based version of dialling 0055.

It's not news that people meet and fall in love, even get married, on the Internet, but what amazes is the almost constant fetish people have with appearance, and the degree of fascination with long-distance fantasy and finding that ideal mate.

Even GIF (photo) files contain endless reams of compressed digitised photo files that people can choose from in order to discover the ultimate question; what the object of interest looks like. However, until everyone can access the power

"The Internet is the great equaliser – better than the handgun. In the real world you might be intimidated by a man's strength but on the Internet I refuse to be virtually raped or politically deconstructed by a man.

generated by using supercomputers and face-to-face communication, the question of self-representation is mainly settled through language.

Of course such practices raise the issue of censorship and what can and can't be transported on the Net. The issue of transmitting pornographic images, for example, will probably never be settled until government intervention. However, as sex sells in a big way, and American magazines such as 'FUTUR SEX' are doing quite nicely exploring the next wave in body-morphing and new sex-aid technologies, government restrictions seem unlikely.

Until the much hyped Virtual Reality Systems to fulfil every desire and fantasy become commonly available, sex on the Net seems destined to proliferate. The Internet is doing just fine in supplying the stuff of fantasy and sexual aggression, and perpetuating the construction of the female body to a male-defined ideal. While women are also taking advantage of the no-need-to-ever-meet and save-the-cost-of-condoms intimacy the Net offers, what appears to predominate is the same old sexism of the real world wrapped in a new package.

Despite these problems, however, many women feel that the Internet has afforded them comparative freedom and sharpened their wits and words. The infamous St Jude – Jude Milhon, retired UNIX programmer and ex-editor of cyber magazine *Mondo*, now turned writer and Net cruiser – acknowledges that even though these systems have drawbacks for women, they are great training grounds for young women.

"When I first started to use this medium several years ago, I called myself 'polymorph'," Milhon says. "I ran amok wearing a mask and experimenting with gender and personae. The Internet is the great equaliser; better than the handgun. In the real world you might be intimidated by a man's strength; one way men have always intimidated women is through sheer physical force, but on the Internet I refuse to be virtually raped or politically deconstructed by a man. You have to martial all your arts and learn to fight with words. One of the biggest mistakes people make on the Internet is to take it seriously, and not appreciate it as the ultimate prankster's medium."

And prank many do. Recently the WELL, a highly regarded hang-out for electronically savvy types, populated by people such as St Jude, Bruce Sterling and even Billy Idol, was the focus of attention when it was discovered that one of its male users was not only having relationships with five women on-line but off-line as well. The fact that they didn't know about each other is surprising in the tightly knit on-line community. It was pure fluke that some of the women happened to be logged on at the same time and busted their electro-playboy.

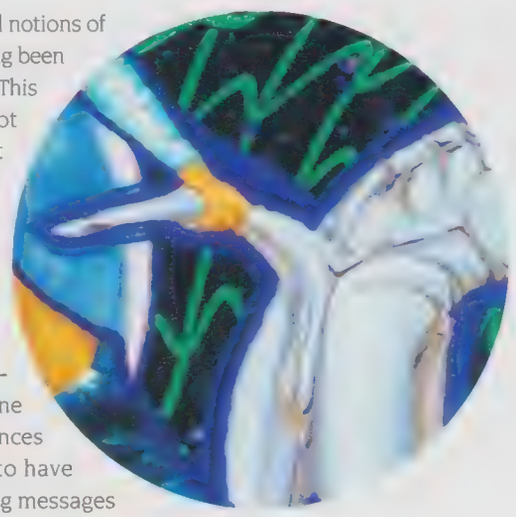
If men have chalked out their invisible territorial boundaries on the Net , then it goes deeper than not allowing women to speak, or using verbose linguistic constructions to win an argument with huff and puff.

Spider Redgold, a self described computer-boffin-woman who has established a computer bulletin-board service for women in South Australia, the Feminine Byte, believes that "computer companies market their computers for women based on user-friendliness, and it's not that women wouldn't buy a 486 or IBM given the choice, it's the strategies of the companies who want women to believe it's harder than it is."

The historical paucity of technical training for women and lack of encouragement for girls to pursue mathematics and sciences at school, has led to women lagging behind male counterparts in familiarity with hardware, software, and computers in general. Introduction to computer systems at an early age is a definite advantage when using the Internet or other systems which require prior knowledge of how to "drive" or operate the system.

It comes as no surprise that UNIX, the operating system and developmental platform for multi-line communication networks, has help at hand for anyone lost in the Net. But you need to know how to ask for it, and the command line MAN (short for manual) is where you may have to start. Or you could nominate yourself as a newbie, military slang for newboy, and wait to be rescued from a simple task. Certainly, terms like 'MAN' and 'newbie' suggest the already gendered nature of Internet design.

According to Sutton, certain stereotypical notions of women are being reinforced. "Women, having been forced into silence, choose to stay that way. This perpetuates the notion that women do not have anything important to say, and also that they cannot express themselves in the 'correct' (note: male, even adversarial) way."



Helen Rose, who works for Kapor Inc in the U.S., found that fighting with words is more effective when women get together to tackle the problem. She founded a group called WNTBMW – Women Not To Be Messed With – an on-line support group formed due to her experiences of harassment in college. She claimed to have been digitally stalked, and recounts finding messages

CYBERDADA: ELENA POPA/IRDY INNOCENT

stating that a man would be waiting for her in dark alleys or the back of her car. Pornographic pictures were sent over the Net, and the university was powerless to do anything about it. Rose claims there are many forms of harassment on the Net.

"Harassment, like in real life, can be very subtle," she says. "Many women feel that being ignored, or a lack of recognition for their input and opinion, also constitutes a form of harassment. WNTBMW has an effect on people who think they can harass other women and get away with it. We believe it's important to make a collective stand and it sure scares people to know groups like this have been formed to combat harassment."

Others feel that cyberspace affords the ultimate in democratic representation. Professor David Farber, from Electronic Frontiers Foundation and the board of trustees of the Internet Society, believes that the Internet is just like New York: "You have to be crazy to visit some places in New York; you are just asking for trouble. Who can blame the muggers if you were warned not to go there. There are a lot of women on the Internet Board and they are very vocal about these questions, however we won't see equal participation of both sexes for at least five years. Until then it's a question of navigation. You think the Net is adversarial because you choose to go to the places only fools would tread. In what other community is it possible to migrate in a matter of seconds? In the real world, once you are there, like moving to a new suburb, you are generally stuck. It's really a wonderful place in terms of efficiency and expressing your views. The ability to say what you like is essential to the democratic process."

Driven by male intellect and vision – what many male users call Netopia – the real problem may be the ratio of men to women. Certainly cyberfeminists such as Dr Sadie Plant from Birmingham University see the electronic medium as eminently usable by women. She argues that since the 1970s, women have seen technology as inherently linked to masculinity, death and destruction. This has engendered a certain guilt in those women who actually enjoy using technology. "Women should be encouraged to go with their desires," she says, "and really get more involved in this machinery that they are getting to like".

With the prospect of on-line face-to-face televisual access, some of the advantages women find in anonymity may be lost. No more signing on under male pseudonyms just to get a hearing. As in real life, women's opinions will be subject to judgement based upon their appearance.

But this will work both ways. No more men masquerading as women in order to take over feminist discussion areas, or simply to 'have fun'. Perhaps less flaming. As the telephone has taught us, rudeness is easier for some when not face-to-face with the target.

Whether the Internet can ultimately emerge as a resource equally accessible and useful to both women and men remains to be seen. ■

Some feel that cyberspace offers the ultimate in democratic representation.

Female UNIX

THE INTERNET'S ASCERBIC SAINT, BOOTS-AND-ALL NETFEMINIST AND PERPETUAL CYBERPRANKSTER, ST JUDE, IS ONE WOMAN WHO TAKES NO PRISONERS ON THE NET. HER MISSILES ON THE MATRIX ARE AIMED EQUALLY AT THE PATRIARCHY AND WOMEN WHO SEEK TO ANAESTHETISE THE NET WITH THE CHLOROFORM OF POLITICAL CORRECTNESS.

by Rosie Cross

More than any other single white female on the Internet, Judith Milhon – St Jude to those on the Net – has made a burning reputation as a flame-throwing feminist. With one eye on the horizon of the new technological frontier and the other on the issues of equality in a cyberdemocracy, St Jude has carved a unique niche. It is often said that in cyberspace, no-one can hear you scream. If anybody has been heard to scream the loudest – and some say, far too often – it is St Jude. Her impact spread beyond the Net as one of the founding editors of *Mondo* where she established a reputation as an electronic Julie Burchill, writing vitriolic columns blasting at technocrats and astutely unveiling upcoming trends. She could also be guaranteed to ask embarrassing questions of Neil Young, David Byrne and numerous other would-be cyber-souls seeking her blessing.

As her columns attest, 10 years as a UNIX programmer have not dulled her sense of humour. Editor of 'CYBER-PRANX', well after leaving her stint with *Mondo*, Jude rampages through the Net, underscoring all who get in her way. Self-proclaimed future-hacker, she now spends time exploring the proliferation of mental "demons" on the Net. Never tiring of being "polymorphic", Jude just can't wait to bud off a new personality which will inevitably take every side of her favourite argument.

Despite the monicker, the ever-ready-to-attack St Jude seems one of the less 'saintly' figures on the Net. As she explains, "Hey, I tried to be just plain Jude, but somebody had that handle already. A long time ago I used to call myself St Jude sarcastically, because I was a revolutionist and that's the saint of hopeless causes." However, St Jude – who describes herself as "a future-hacker; I'm trying to get root access to the future. I want to raid its system of thought" – comes across as a fiery mixture of saint and devil's advocate. Where else would such an interview take place but on the Net, where typically, it's not hard to hear St Jude scream.

St. Jude: I gots the intermediate, oh so inadequate, present technology blues. I'm nostalgic for the future. I need the stuff that we can dream it but we can't be it, yet. I don't want any of this virtual crap: I want the real thing. Ordinary reality is too virtual already. We need bandwidth! We need ultra-high res! Give us bandwidth or kill us! Let's see the ultraviolet polkadot flowers that hummingbirds see, and smell 'em like the bees do. And crank UP the sensorium all across the board: TURN IT ALL UP TO 11! And bring that synesthesia over here. We can have the systematic disorder of our same-same usual senses, certainly, but then let's have some home-brewed special senses we whip up to our own taste. Like with sensory equalizers, band-pass filters, flangers. New vocabularies. Very rich. Yum yum.

How come you're sick of all this stuff about women and technology? Do you think the issues of feminism and technology are resolved, stagnant? Where do you fit into the picture?

No. No no, I think tech will solve all our problems, personal AND scientific. Girls NEED modems. Let's talk techytalk.

Do you think that 'electronic salons' – women-only spaces on the Net – are important? Ones that allow women to 'gag' dweebs, dorks, cyber bores, etc.

Hanging out with nice people is nice. But I don't want to sit around in this elite club all the time: the Politeness Ghetto. Hanging out with nasty-ass bigoted male teeners is also good, if they have stuff I can learn from. I may pretend I'm a snotty male teener myself. And why not? Particularly if I can turn somebody around with my expressed deviant opinion – 'I'm a gay snotty male teener, now that I mention it'. Sticks and stones may break my bones, but words on a screen get at me only as much as I allow them to... I can get very tough on-line. ANYBODY can be tough on-line. Just keep your cool, and THINK before you type.

There is a lot of concern about American female academics taking over the Internet and setting the agenda, in a style which has overtones of a class war between the information rich and poor. In very similar ways, we accuse the patriarchy of constructing the spaces and language women use and occupy. Are American female academics 'ghettoising' these spaces, entrenching their 'class interests' and setting themselves up as cybercops?

Like backhanded censorship? John Gilmore of the Electronic Frontier Foundation told me what may be the quote of the year: "The Internet treats censorship just like any other glitch: it routes around it". To use the language of the academics, "the discourse is propelled by desire" – and love laughs at locksmiths. So we'll talk about what we love to the people who can hear us, and if people keep on bullying us, after a while we'll find another trysting spot, and leave the cops to themselves. I'll say more about the academics later, but keep in mind we always have to drive the so-called Infobahn defensively. Whether we're set upon by zealots or bigots or abusively correct politicos, we have to learn to defend ourselves.

Any kind of on-line attack calls for martial arts – Aikido may be best – to use the enemy's strength against them harmlessly, but martial all your arts. Learn how to mount an argument and win. I'm not going to be undressed – or deconstructed – without a fight. So, learn to fight! This is the best training ground for women; we may start 10 down in a physical fight, OK, but the keyboard is the great equalizer – better than a Glock .45. And combat on the Net is like Basic Training. The lonesome 14-year-old girl that I used to be could have managed her life a lot better if she'd been through this kind of Boot Camp.

Is the Internet safe for women; is virtual rape possible? What should women do to virtual rapists if they caught them – what's a suitable punishment in data space?

Keep in mind, in cyberspace EVERYONE can hear you scream. There's a woman crying virtual rape in LambdaMOO right now. A gay guy who was in real-life beaten and raped told me about this with great distaste: "Victim is the cry of the '90s, but nobody, NOBODY is raped in cyberspace". It's a game, lady. You lost. You could have teleported. Or changed into an Iron Maiden, the spiky kind, and crimped off his dick. But by playing it this way, you've REALLY lost. Because the MOO's also a social space, where you can meet people with REAL cultural differences – like Klansmen – and make them respect you as a woman, as a dyke, as whatever. Toe-to-toe, you maybe change their prejudices forever. My gay buddy says he's battled people this way for years... he's an on-line warrior for civilisation, yes. Ignoring people until they go away changes nobody's behaviour, and it certainly doesn't change their opinions. Cries for niceness don't make it. Toughen up! You're dealing with people here, and primates act better when you stand up to them and give them a reason to respect you. I hate this 'Waaaah! I'm a poor sensitive weak woman

So, learn to fight! This is the best training ground for women; we may start 10 down in a physical fight, OK, but the keyboard is the great equalizer – better than a Glock .45

protect me' shit. This kind of stuff generates MORE contempt for women. Uh oh, I can feel you scowl – now remember, ain't I a woman? Let me look: yes, yes I am.

So... FUCK NICENESS! What would have happened if Anita Hill had not felt constrained to be nice? If she could have given her boss a sassy, maybe unprintable, rejoinder that said in a humorous way to 'cut the shit, let's get on with the work'? Self-defence. It's not learning how to cuss, girl, or how to act hostile. It's learning how to fence with words – make your opponent feel your point, and laugh at the situation, and respect you. Learn how to win. No more Ms Nice Girl! Develop the cutting remark, the tongue that cuts! Just say 'Bobbitt!' Oh no ... I didn't mean that. Heh heh.

Women conference spaces on the Net are being taken over by men. A lot of people feel this is men trying to become more feminine, and understand the female psyche. What do you think?

How do you know they're men? I'm no lady, darlin'. How do you know I'm not a man? How are you going to let only genuine gyno-type double-X, Barr-body bearing, real virtual women into your virtual salon? As those adventure games put it, "I see no genitals here". If they say they're women, I say they're women, and should be treated just like the rest of us – badly.

Anyway, I think it's touching that men should become transsexual moles, to try to understand women this way. It may be that this is the only way the alien sexes can honestly converse – when they're bodiless, nothing at stake, behind the masks of their pseudonyms. On-line you can learn to be fearless, you can afford to be bold. I've found myself saying things on the telephone that I wouldn't say face to face, and the Net subtracts even the human voice. When you got nothing, you got nothing to lose. I can play amazing pranks, or I can do something even more outrageous: I can be honest. Say stuff so personal and real that my mind boggles to think about it now. This could be a breakthrough for humans learning about humans, not just men and women learning about each other. Sounds OK to me. ■

On-line you can learn to be fearless, you can afford to be bold. I've found myself saying things on the telephone that I wouldn't say face to face

THE HIGH LIFE & TIMES OF TIMOTHY LEARY

FEW LIVES IN THIS CENTURY HAVE BEEN GREATER MAGNETS FOR CONTROVERSY THAN TIMOTHY LEARY'S. BUT BEHIND THE INFAMY THRIVES A PHILOSOPHER FOR THE FUTURE.

by Michael Hast

Illustration by Gregory Baldwin

THE ONE-TIME HIGH PRIEST OF THE INNER VOYAGE FOR A GENERATION OF BABY boomers, the merry prankster of Harvard and all points inwards, Timothy Leary has endured a 25-year maelstrom of contentious publicity and disinformation. A storm of controversy has obscured the real man, his beliefs and accomplishments.

The clouds have passed, and for the last decade Leary appeared as a prescient commentator, witty provocateur and influential visionary. Audiences around the world – at universities and colleges, at computer fairs and education days – now hear from the man who describes himself as one of the 'cheerleaders of cyberspace'.

Before his introduction to psychedelic drugs in 1960, at the age of 40, Leary had already led a life of achievement. After earning a Ph. D. in psychology at Berkeley, he became an early proponent of group therapy, then a radical technique but now perhaps the most widely used psychotherapeutic regime.

His professional writings during the 1950s remain standard texts in their field. His "Interpersonal Diagnosis of Personality" was named the best work in psychotherapy in 1957 by the *Annual Review of Psychology*. Leary's success culminated in his appointment to the staff of Harvard University in 1959.

At Harvard University's Centre for Personality Research, Leary started his clinical study of psychedelic drugs. He had the backing of the university (LSD was legal until 1966) and his experimental program attracted such collaborators as novelist Aldous Huxley, British psychiatrist R.D. Laing and poet Allen Ginsberg.

Unlike the clandestine LSD experiments conducted by the CIA and other U.S. government agencies, Leary's work went on in the open. Word quickly spread throughout scientific, academic and artistic communities, and from there to the embryonic youth movement starting to coalesce around the issues of civil rights, freedom of speech and anti-materialism.

Leary ignored the growing furore over his LSD experiments and public pronouncements; he and his cohorts were onto something big here, neurologically big with a capital N. The notoriety that attended his personal advocacy of drug use (his phrase 'Turn on, tune in, drop out' was first uttered at the famous first 'Love-in' in San Francisco's Golden Gate Park in January 1967) embarrassed Harvard, and he and fellow researcher Richard Alpert (later known as Baba Ram Dass) were fired amid charges that they had broken an agreement not to use undergraduates in their experiments.

Leary soon found himself swept along by tidal waves of social and cultural change, navigating between hero worship and virulent harassment.

With the help of wealthy donors, Leary established a new research centre in a large rural mansion at Millbrook, New York. The Castalia Foundation attracted such pilgrims as Ginsberg, Ken Kesey, William Burroughs, and, eventually, local lawmen, led by G. Gordon Liddy, later first stringer on the White House Watergate team. It has been speculated that it was Liddy who convinced Richard Nixon to publicly dub Leary "the most dangerous man in America".

"Nowadays, the language we use to describe the effects of all drugs, and the reaction to them, is in terms of how the brain is actually organised and how it stores, processes and recalls information; computer terms."

Leary's prominence as an advocate of non-medically supervised LSD use stirred up the prosecutorial and judicial hostility that finally, in 1970, landed him behind bars in California, facing 10 years for possession of a small amount of marijuana (now a $100 on-the-spot fine in California). There were some people who thought Leary should be in jail forever. He says he was set up. "If I wanted to smoke marijuana, I certainly wouldn't carry two roaches around with me. I'd have a nice big bag or something."

Although a model prisoner, eight months into his sentence Leary escaped with the help of the Weather Underground and, perhaps, the Brotherhood of Eternal Love. He surfaced in Algeria as a 'guest' of Eldridge Cleaver who had set up a Black Panther 'government-in-exile'. Cleaver proved to be an erratic host at best – at times placing Leary under 'house arrest' for perceived ideological transgressions – and Leary sidestepped his clutches.

Leary next bobbed up in Switzerland in May 1971, where he stayed in the ski chalets of various wealthy Europeans including the Opels of German car fame. He wandered freely, although in disguise, through Europe and Asia for the next 18 months, but was eventually recaptured by United States drug agents in Afghanistan and extradited from the United Kingdom to the U.S. He was sent to the maximum security Folsom Prison in January 1973, and many thought that was the end of Leary; that they'd thrown away the key. Charles Manson was a cellmate for a while, reading passages from the Bible to anyone that listened.

As passions cooled in the '70s, and Watergate revealed the rampant transgressions of the Nixon years (some of which saw Leary's nemesis Liddy imprisoned), Leary's sentences were reviewed and he was paroled in May 1976. Leary had spent more than four years in two jails. But, grasping an opportunity as always, Leary turned this to some advantage – much of his incarceration was spent thinking, writing and dreaming.

Now a resident of Los Angeles, Leary's motives, always exploratory and seemingly altruistic, are unchanged by the wild roller-coaster journey he took during the '60s and '70s. Today he calls himself philosopher, author, actor, computer-software designer, lecturer, nightclub performer, freelance gadfly and "ahead of his time".

The 'gadfly' label stems from when Leary, the high priest of the '60s, became the Hollywood party person of the '80s. He was on everybody's A-list, but then Leary was always unashamedly populist. In 1994, there are not quite as many opening nights, producers' playtimes and nights spent holding court at his large circular table at Helena's, Jack Nicholson's private supper club where Jack himself holds an alternate court two tables away.

Since the mid-'80s, Leary has also thrown himself into the cybernetic revolution. Now he advocates an holistic approach to consciousness. He says computers have the potential to become liberating agents, as a medium for individual empowerment and growth in science, art, philosophy and other fields of creative endeavour.

With 25 books to his credit, and hundreds of articles and interviews in scientific, scholarly and popular magazines, Leary has never relinquished his provocative role in the global theatre of ideas. After countless appearances on television, several films and hundreds of college and university lectures (including a notorious debating tour with Liddy), Leary took his irreverent wit and fantastical observations on stage at comedy clubs around the United States. Like his good friend Allen Ginsberg, whose place in the public mind evolved from pornographic beatnik to revered man of letters, Timothy Leary is increasingly being perceived as one of the 20th century's more influential visionaries.

Timothy Leary lives with his fifth wife Barbara, 30 years his junior, and their teenage son in a tasteful Beverly Hills eyrie, overlooking Cary Grant's old mansion and the Los Angeles

sprawl. It's not a bad life, he says: "The Sunset Strip is my turf. That's where I meet old friends, new friends. There are always a few people I want to meet – at Helena's or at other restaurants." A fanatical champion of free choice – for everyone, in all things – Leary still finds the trendsetters irresistible. And he sees no contradiction between the dictates of current style and individual choice. He says the aristocracy has always packaged the ideas, decided how we dress, what we eat and what we talk about.

"Remember, I am a philosopher. My ambition is to be the MVP of the 20th century – Most Valuable Philosopher. If you are a true philosopher, you are going to be involved not with the political powers but with the cultural powers. They're much more important. They change the songs, the language, the mores. And a philosopher's duty is to be where the action is."

Rarely dressed down in public (he was born into the middle class, son of an army officer father and a teacher mother, in 1920, and went to Holy Cross University and the U.S. Military Academy at West Point), Leary sports neatly pressed trousers, an open necked shirt with no labels or slogans and grey leather shoes. He looks fit for 74, lean and tanned. The hair is silver grey and thinning now, but still a fair crop. Good genes.

Leary's brain is ever abuzz with the new ideas, the new concepts, of a man forever exploring, always probing for the soft spots in the barriers of convention. Even on the telephone it's hard to keep Leary still. Now an elder of his tribe, the flesh may be weakening but the mind is still a turbo-charged monster. His thoughts still overwhelm his conversation at times.

The ideas and explanations come tumbling out like gold from a jackpot payout. Sentences are left hanging, but you know what he was going to say in those last half-dozen words anyway. It's almost as though Leary is communicating to your brain with pictures sent from his brain – throwing in a few cryptographic patterns just for good measure; to placate the hopelessly linear minds.

He's asked a question that requires his physical presence in the study. Before there is time to offer the obligatory apology for inconveniencing him, or withdraw the request, Leary is off like a roadrunner.

"Right, I'm walking out to my study, with the hand-held phone, and there's the cat over there; now I'm in the dining room, passing the Keith Haring table; now I'm in the laundry room, turning left. Here's the study... (mutters) put the other phone down and pick this one up so you can hear me better... hold on... Michael, are you there? Now isn't that better?"

Timothy Leary gets quite evangelical when talking about computers and the new technology. He probably ignored the eggheads up the hall working on the early computers during those halcyon days at Harvard; when he and his little group thought they had discovered the molecular grail that would save the world.

"Remember, I am a philosopher. My ambition is to be the MVP of the 20th century — Most Valuable Philosopher. If you are a true philosopher, you are going to be involved not with the political powers but with the cultural powers."

In his enthusiasm for his most recent cosmic answer – interactive software and cyberpunk computer freak consciousness – he seems to have embraced his psychedelic past as well, proclaiming that "the psychedelic revolution was the forerunner of the cybernetic revolution" and lionising Steve Jobs, the co-founder of Apple Computers, other luminaries of America's new silicon industrial complex, and cyberpunk authors such as William Gibson and Bruce Sterling.

"My good friend William Gibson often says: 'My greatest anxiety about the future is that we will arrive at a point at which history itself becomes totally flexible. Some of the more negative possibilities of high technology that I have been able to dream up suggest that we may come to a time beyond time. We may arrive at a point beyond history where we live in a perpetual video present.'"

Says Leary: "But this is the point: what is reality/history? And is it necessarily a bad thing to live in a video present?"

In the '60s, Leary promoted LSD as a way to find new realities; to explore the corridors of the mind, the circuits of the brain that remained closed due to rigid social structures and conditioning. Now he advocates an holistic approach to consciousness. He says computers have the potential to become liberating agents, as a medium for individual empowerment and growth in science, art, philosophy and other fields of human creative endeavour.

"In the '60s at Harvard, people like Ginsberg, Huxley and I were people from the Mechanical Age trying to work out the computer that was the human brain. We couldn't do it; we were working with words like 'illumination' and 'bliss', words from another time; words from the past. Nowadays, the language we use to describe the effects of all drugs, and the reaction to them, is in terms of how the brain is actually organised and how it stores, processes and recalls information; computer terms. The great breakthrough in the information sciences and our knowledge of computers is leading us towards human brain evolution.

"Humanity's post-industrial cyber era is characterised by a dissolution of the relevance of what has, up until now, been regarded as the 'real world'. It has been termed 'real' because it has been the one and only physical universe whose existence

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to show "mind movies" that provide blueprints of the human psyche

is known; it has had a monopoly on the stimulation of the inputs of human sensory organs. Artists from the dawn of time have striven to create alternate realities; attempted to stimulate other human's senses in an act of self-awareness and intention from those of the non-human, natural world. The words 'art' and 'artificial' share Latin origins: 'ars' meaning 'craft'. Now, improvements in technology have contributed to the increasing sensory completeness of the artificial. Art, music and sculpture typically appeal to a single, or a few, sensory channels; now the experience can be all-encompassing. However, neither traditional art nor architectural, artificial realities modify the rules of operation of the perceived universe; they just modify local visual or spatial properties.

"The key difference in computer-generated artificial realities is that their rules of operation are as mutable as their immediate form. They can be more interactive, most responsive to improvised interplay with humans at arbitrarily fine levels of detail. I am not talking about the prosaic applications of computers as design aids for architecture and inspection of the 3-D form of buildings not yet built, but of dynamically reconfigurable architecture realised by computer-projected holograms. Virtual reality. My living room in yours, at the click of a mouse button. The technology is both quantum and cyber. Quantum in its basis on digital communication and computation; cyber in its ability to empower the individual to lead an autonomous yet interacting life of increasing choice.

"I'm involved in another revolution," he says, excitedly. "There is always a revolution when a new technology develops. Look at the first motor-driven vehicles, the steamship and the railroad; both owned by large corporations and government. Henry Ford was the genius that said he wanted to put the average person in one of his black model-Ts. And he did it. Now, in the electronic digital arena – which I call cyber – there is a similar devolution of power. From the huge mainframes owned by government, the military and large institutions, we are seeing the same computing power being put on individuals' desktops.

"New technologies now allow average people to turn their home into a television studio. This computer/video technology will be to television what the telephone was to the telegraph. A new way of communication is being put into the hands and homes of everyone. It has powerful implications for politics, culture and society generally." Leary has always maintained that the real revolution of the '60s was a neurological one; that its seeds had not yet blossomed. He now says the cyber culture is part of that outgrowth.

"The psychedelic revolution was the forerunner of the cybernetic revolution. And one of the initiators of this revolution is Steve Jobs. He is a product of the psychedelic revolution. You've got to hand it to the guy, he's an extraordinary person. There are few people who reach his peak at such an age. He came out of the 'burbs of Silicon Valley and had earned $10 million by age 23. He was the richest young person in the world; he made it with his ideas; he made it with a vision.

"Let me give you a remarkable statistic: the average American home has the TV on seven hours a day! Basically, network TV controls your screen, and network TV is like an illuminated bible of 15th century Europe – only the Duke could afford to own a copy, so few people saw it. Then came the invention of the printing press, and Gutenberg's movable type, and suddenly everyone could own a bible. The new cyber technologies are doing the same – we can all have television studios in our own homes."

He believes computers can be used to show "mind movies" that provide blueprints of the human psyche. "My mind movies utilise the computer like a digital camera. It allows a person to put their thoughts, images and sounds onto the screen. Instead of being a couch potato passively observing network or cable TV, you can be inserting your ideas onto the TV screen."

Leary's latest venture might seem a bit tame in comparison with his clarion calls of yesteryear, but to the former Harvard linguistics professor, it's all the same. "In the '50s, I was the father of humanist psychology; in the '60s I was activating and mapping altered states of consciousness using chemicals; now, in the '90s, I'm doing it with computers. It's all language.

"There has been an incredible empowerment of humans in the past three or four years with the emergence of the new electronic bulletin- boards, the new CD-ROM, QuickTime, and all the programs that allow a 10-year-old kid to pull anything that's on [video] tape, scan it into a disc and edit it. A 10-year-old kid can be a film editor. Not only that, but if you hook up to a telephone, you can be in Australia looking at me in my study. You might have a question and I'll say, 'Look up there on the shelf' and you'll click on that. 'There's a book on Burroughs' and you'll click on that...and up comes all this information. You can be in my living room, I can be in your living room. That's what this new CD-ROM I'm working on will do.

"Every kid younger than 12 has mastered Nintendo, has mastered computers. Better than Grandfather, better than Dad. The stuff we're doing is no game; it's where you interact, interpersonal communication. Some of it looks like a game. You could go into my living room and see an icon: My 10 Favourite Movies. Click on it and there's a list. Something like that can often tell you more about a person than more complex concepts. You could compare your lists; it becomes a neutral teaching. I've learnt so much about movies I've never seen and books I've never read by doing just that with people. This is the glory of interpersonal exchanges via virtual reality.

"In the '50s, I was the father of humanist psychology; in the '60s I was activating and mapping altered states of consciousness using chemicals; now, in the '90s, I'm doing it with computers. It's all language."

"McLuhan pointed out 20 years ago that using the cryptographic technique – using letters to make words that only people of your language can understand – will not dominate forever. Books and the written word will always be around – like the oral tradition that's stayed with us – but we'll begin to treasure them more and more. They will be like painting. At one time the only way to communicate was through painting. As a central way of communicating, written words are simply located, defined and isolated with your own group that know English. Words have always hampered communication, but now we are aware of it and we have another way of dealing with it by sending each other screens full of information. Words are wonderful. With the massive amount of data now being thrown at us from every source, the skill in the future will be indexing and retrieval activities.

"There is another element to all of this so-called information overload – you must realise that the younger the person, the more information they can deal with. I call it RPM – Revelations or Realities Per Minute. Of course, all of the rules and the laws of psychiatric diagnoses are made by older, white people. The number one – now this is a joke – psychological disease right now among young people is something that's called ADHD, Attention Deficit Hyperactivity Disorder. Naturally, among ourselves we laugh because my attention span is just about zero; hyperactivity, of course, means you're thinking too fast... the point I'm making is that being overwhelmed by too much data is the pathetic cry of a senile person over 40 that can't deal with the future! [Chuckles merrily] It's been like that for years when something new comes along.

"Learning how to index, learning how to look at files, learning directories, etc. becomes automatic for young people attuned to the digital age. Older people can learn these skills, but they have to learn from a 16-year-old. The problem is that the people who are doing the Information Highway – the Barry Dillers and the telephone people and all these big corporations – they don't have a clue about what's really going to happen in individuals. If you are over 40, you won't understand the digital culture, but don't despair, ask your children or just go next door and talk to your neighbour's children, they'll be glad to show you! I've got a 12-year-old African-American grand-daughter and she comes in and handles my computer better than I can.

"There is an incredible fear factor associated with new technologies. I can remember my grandmother would not have a television in her house. She thought they were dangerous. I had to take one around there and give it to her. With something so new, there is a phobia. A lot of people have a phobia about computers; it's incredible."

In the presence of Dr Timothy Leary, candidate for this century's most valuable philosopher, words come tumbling out on any topic in the universe. The voice starts off softly and warms up. He becomes most animated when discussing his latest cybernetic projects. Sometimes there's a certain world weariness, a moment of impatience when you're not keeping up with him, but it flashes by as he regains your understanding. Leary's eyes dance around the room, ever on the lookout for some merry prankster opportunity. Or fix you with an incomprehensible stare, then soften. The energy level rises as he wades into another explanation of what today's technology will mean to people everywhere. "Computers are now the best weapon that individuals have to change their reality... to substitute official reality with virtual reality."

There's a restlessness of soul about him. Even at the end of a full day there seems to be more where that came from. He tires but seems to have the ability to quickly recover. He takes little catnaps, but if there is action, Leary appears and seats himself with his back to a corner; the room and its people fan out in front of him. He's not in the centre, but closer to the front, where he's always been. ■

"Computers are now the best weapon that individuals have to change their reality . . . to substitute official reality with virtual reality."

MUCH HAS BEEN ACHIEVED IN THE 20 YEARS SINCE CHARLES BIRCH WAS A LONELY VOICE AMONG BIOLOGISTS ARGUING AGAINST ENVIRONMENTAL DEVASTATION AND UNFETTERED ECONOMIC GROWTH. BUT THE MAN ONCE CONSIDERED AS AN 'ECOLOGICAL NUT' SAYS THERE IS STILL A LOT OF GROUND TO COVER.

The Colour of Money

by Rick Slaughter

Illustration by John Spooner

CHARLES BIRCH IS WIDELY REGARDED AS ONE OF AUSTRALIA'S MOST ENLIGHTENED THINKERS OF THE CENTURY, AND STANDS TALL AMONGST RESPECTED COMMENTATORS, WRITERS AND SPEAKERS ON THEOLOGICAL AND ENVIRONMENTAL ISSUES.

His ground-breaking 1976 book *Confronting the Future*, revised and re-issued in 1993, systematically appraises the challenges confronting Australia and the Western world. His 1990 book *On Purpose* attempted to create new values for a world dominated by science and technology. This was followed last year by *Regaining Compassion for Humanity and Nature*, which explores alternatives to the materialistic fetish of Western civilisation.

Birch, born in Melbourne in 1918, is a member of the Club of Rome – the international futures think-tank – and Emeritus Professor of Biology at the University of Sydney.

Rick Slaughter: *Your book* ***Confronting the Future*** *touched on many of the key issues that need to be understood in this country. What were the book's origins?*

Charles Birch: The president of the Club of Rome, Aurelio Peccei, came to Australia to promote the idea of 'limits to growth' which the Club of Rome had pursued since the early 1970s. He got together a few people to become members of the Club of Rome and promote its philosophy. They were Sir Gus Nossal, myself, an industrialist in Western Australia, and [former Governor-General] Sir Zelman Cowan. Our meetings stimulated me to write something on limits to growth which would be relevant to Australia. It contains a virtual philosophy of the limits to growth. Later I became very familiar with it because I got to know Jorgen Randers, one of the authors of the original *Limits to Growth* study, very well. He came out to Australia and said, "you know we were talking about models of the future? Well Australia is the sort of continent in which you ought to be able to develop something on those lines". It was the inspiration he had which I thought was very interesting, and I wanted to do something about it.

If you were to encapsulate the main theme of that book, what would it be?

The point was that you can't keep on growing in terms of material wealth. There comes a point at which you've got to choose limits due to the impact on the environment. The question was posed by Randers and also by the then Brazilian Minister of Environment. I said to the minister: "Brazil is going full steam ahead as though there are no limits to forests, no limits to rivers, seas and all the rest of it." Brazil was in a bad way destroying the environment, and he was the minister responsible. He said, "it's all very well for you, but what about Australia, what are you doing about the problem? Could you give us a model to follow?" That seemed to be an appropriate challenge – so I wrote the book.

And yet the issues you've raised, such as a re-thinking of economic growth, are not easy to grasp or change.

Of course not. In fact the biggest obstacle to thinking about the subject comes from the people who think the only solution to all our problems of unemployment, inflation and what have you, is continued economic growth. The index that all governments – state and federal – use to measure the health of society is whether it's growing economically or not. Now the argument hinges on what sort of growth we are talking about. The problem to me is why can't we have an economic system in which you have more schools, you have better hospitals, you have better roads and bridges and all the rest of the things that are really needed? Why can't we do that in this country? Why do we have to produce things which the world is producing too many of anyway? That's a real problem which the economists should be able to answer.

Given that economic rationalism is so solidly embedded in Canberra, how can you get across the idea that the old style GDP-*measured growth is getting very dangerous?*

It's demonstrated every day, of course, with what's happening around the world in terms of pollution in the cities, soil loss through unsustainable agriculture, and the meaninglessness that stems from a materialistic outlook. Bob Hawke did admit once that one of the worst problems in Australia was the loss of top soil. So he had his billion trees campaign. Then the government set up a land care scheme which was pretty radical. We've got to conserve that particular resource in the environment. We've got to spend money on it. So there are some pointers here and there. The campaign to save the

"They used to refer to me as an "eco nut". But now there's a general acceptance we have a problem, and you're not simply regarded as a nut if you raise issues about the environment".

Franklin River in the west of Tasmania had a big political input that would never have come off without the federal government coming in. So there are indications of hope. One can afford to be a bit optimistic.

When I first wrote *Confronting the Future*, most of my colleagues just thought I was crazy. They used to refer to me as an "eco nut". But now there's a general acceptance we have a problem, and you're not simply regarded as a nut if you raise issues about the environment.

So you've seen a real change in outlook?

There's been a tremendous change in perception by Australians as well as people around the world. It doesn't mean that they know what to do about it, but they are concerned. In Australia there are over 1,000 grass-roots movements now concerned with the environment, which is pretty impressive in many ways. There are also a substantial number of economists around the world now who are at least talking about ecological economics. There's even a journal for ecological economics, which would have been unheard of 10 years ago. These people are trying to put the issue of environment into every economic equation – something which was not done by classical economics at all.

Could a new economic outlook be on the way?

Yes. You see, a few years ago there were only about five or six substantial economists who in fact were pushing the notion of an alternative to 'growth forever'. One of them was Herman Daly, who eventually got a job at the World Bank, believe it or not. He's the one who had some influence on the World Bank's attitude towards environmental issues, but now he has quite a few supporters.

In the foreword to the new edition of **Facing the Future** *you say there has been some change over the last 15 years.*

One is what you've already mentioned, the greater perception in society about environmental issues. That's become really very, very important. Another one is agriculture. Some years ago you couldn't talk to agriculturalists about Australian agriculture being unsustainable. Now there are courses on sustainable agriculture. The economists were very opposed to this, but it's happening. The agriculture school at the University of California was actually sued. A court case was made against it by a woman who complained that they taught unsustainable agriculture there – and she won! It's an unusual way to do it, but the university was forced, then required by law, to put courses on sustainable agriculture into its curriculum.

Is the question of the long-term sustainable population for Australia unresolved?

Oh yes, because at present Australia has no population policy at all. Currently, however, the Senate has a committee of enquiry into a sustainable population for Australia. There were calls for submissions from all around the country. So the question is finally being asked about how many people Australia can support. That was a question politicians never used to ask.

You mention in your book the view that population impact cannot be determined by crude numbers but by Population x Technology x Affluence. Does this mean that the total impact of Australian population is far larger than it seems?

Yes, I think if you do the sums you'd say the impact of 17 million people on Australia is equivalent to about a billion Indonesians. It suggests that the developed countries are the real despoilers of the Earth, not simply those in the Third World chopping down forests.

The fact that we can go for so many years having an immigration policy in the absence of a population policy suggests a lack of long-term thinking in politics.

The analogy Paul Ehrlich used when he was here is useful. It's like giving somebody the instructions to build an aircraft in which you tell them how many people it must be able to board every minute or so, without saying how many people in total the aircraft should take. Ehrlich has been one of the strong advocates of a population for Australia a good deal less than what we have at the moment; that is, less than 10 million.

Can you outline the essential ideas behind **On Purpose**?

The main idea was that it seemed to be important in human society and in individual human lives to have clear-cut purposes and know how you could achieve the purposes that you chose.

Science is producing a picture of the world in which the word 'purpose' never comes in at all. I wanted to know the extent to which the notion of purpose might be relevant in the rest of nature, and the only way in which I can make any sense of it is as a concept that goes right down to the building blocks, the atoms, electrons and all the rest of it. So there is a philosophical side which I put in right at the beginning of the book – which some people found difficult.

Then there's a practical side: what difference does that make to what you do with your life? What you do with the world? A good deal of the book is spent on evolution: cosmic evolution, biological evolution. The extent to which the concept of purpose is relevant, then, I think is clear. But the Darwinian understanding of evolution leaves it out altogether because it is a completely mechanistic scheme. So the book is an attempt to bring something which is non-mechanistic into the mechanistic picture.

Some people who were not scientists found the science difficult, and some who were not philosophically minded found the philosophical bit difficult. That's partly why I wrote the next book, *Regaining Compassion*. I wanted to win over people who have been lost from something that's a bit too difficult for them.

In ***Regaining Compassion for Humanity and Nature****, you write about three attitudes towards the environment: exploitation, stewardship and compassion. Now, until I read this, I assumed that what we needed was a stewardship ethic in this country. But what you've done here is to take an extra step and say we need to go beyond stewardship to compassion.*

The notion of stewardship is a very common one and certainly the one which is promoted by Christians who get it out of Genesis. You look after nature because nature looks after you. It's an instrumental approach to the world and it very quickly and easily leads to the notion of exploitation. You don't remain a steward very long before you begin to exploit things. So another possibility is that of compassion. It suggests that you have an attitude to all life, human and non-human, in which you recognise there is something of intrinsic value which should be respected. By intrinsic value I mean entities that feel, are sentient to the world around them and have an intrinsic value.

In other words, you value them or they value themselves quite independently of their usefulness to other creatures, including human beings. This view hasn't been taken too seriously in the West. It's of course always been taken seriously by Buddhists and some Hindus, but not by Christians for various reasons, and certainly not by the scientific community.

Can you get to the notion of intrinsic value by reasoning, or do you have to make that a fundamental postulate to begin with?

Oh, I think you do it by reasoning. The question one might ask is, are there values other than instrumental values in nature? We recognise in human beings that there are; human beings have a value in themselves, quite independently of their usefulness to others. So you then ask the question, does that apply to other creatures? The argument is: yes it does apply to other creatures. It would only apply properly if they are also sentient and have a feeling for the world, so we should respect feeling wherever feeling exists. People are able to do that in relationship to their pets. They have no problem with wild birds that they may feed. But anything beyond that they tend to ignore.

You've said in ***On Compassion*** *that modernity has failed to point a way beyond injustice and the destruction of the environment. Is it difficult to visualise a viable future within the parameters of the modern mind?*

Yes. The 'modern mind' and the 'modern world' have very specific meanings. They refer to the scientific technological world-view arising out of science, which has a very mechanistic outlook, and this is why some of us talk about the re-enchantment of science. The model is not just a mechanistic one. It's one which includes subjectivity or, in other words, the feeling side of things, consciousness. Science hasn't got anywhere with that. In so far as it deals with issues of feeling, consciousness and purpose, ultimately we try and reduce everything to what the atoms and molecules are doing. That's fair enough in itself; but in the end it tends to leave out the subjective component.

Is it possible to move towards a view of not just the re-enchantment of science, but the 're-enchantment of the world', seeing purpose as a structural aspect of the world?

Yes I think so, I think that's what is being done by some people. It's against the modern, dominant trend of course. But that doesn't worry me too much. I tend to think against majority movements anyway. If they have anything in them they will become more influential in time. Perhaps my problem is that I'm not very good at creating metaphors and images and stories. They are the only ways you can get things across these days.

Can you think of two or three concrete things that you would suggest if Australia were to take seriously the idea of building a sustainable society?

Almost everything that I would want to recommend from *Regaining Compassion* doesn't have a political platform at the moment, you know, wouldn't get in. But grass-roots activity will change that. I often quote Pierre Trudeau when he was prime Minister of Canada going to a meeting of the Club of Rome saying "I believe all this stuff about limits to growth, we've got to do something about it, we've got to change our national outlook and way of doing things. But if I go back to Canada and put that on the platform, I'll be tossed out tomorrow, I don't have the grass-roots support".

So what we can do is to keep on increasing the grass-roots support. It has a fairly substantial base in Australia at the moment. We must let people feel that they are important, that their influence can be decisive in changing things. They changed the outcome of the Franklin River controversy, they are beginning to change agriculture, and they may even change cities.

Maybe the governments are the last to find out that changes are underway.

I don't think governments can lead the way. But they will have their noses to the ground and will take note of important movements. They're finally taking note of women. But they didn't 10 years ago.

Will change finally come through grass-roots activity?

Yes. The changes that have already occurred have happened that way. The meeting of world leaders in Rio last year was not due to the United Nations leaders, it was due to grass-roots movements, conservationists, people who care.

"If you do the sums you'd say the impact of 17 million people on Australia is equivalent to about a billion Indonesians."

WHEN SMALL COUNTRIES ARE INVADED BY LARGER, STRATEGICALLY IMPORTANT NATIONS, THEY ARE FORCED – THROUGH THE COMPLICITY AND HYPOCRISY OF SMALL AND LARGE NATIONS ALIKE – INTO THE GAP BETWEEN EMPTY MORALITY AND TRUE JUSTICE, ARGUES THE LEADER OF EAST TIMOR'S DIPLOMATIC RESISTANCE.

Generous Lies

BY JOSÉ RAMOS HORTA

IT WAS ON A WARM OCTOBER DAY IN NEW YORK ALMOST 15 years ago that I joined a small crowd of a few hundred outside the United Nations building. There were a smattering of foreign correspondents who cover the U.N., an assortment of diplomats, and the elderly Javier Perez de Cuellar, the Peruvian career diplomat and then Secretary-General of the U.N., who was officiating

We had come to see a flag raising. As I watched from the crowd, a U.N. protocol officer tugged on a rope, and the multicoloured flag of Vanuatu rose slowly above First Avenue, joining the 150 other national symbols that fluttered in the mild breeze

My happiness for Walter Lini and the people of Vanuatu was tinged by a great pall of sadness. There I was, almost a New Yorker after six years in the Big Apple, with no country and no light at the end of the tunnel. Not for East Timor.

I knew Lini well. In the early days in New York, Lini was much like me – an unknown entity who flew in from his distant island to put his case to the world community. I had been there a few years already, acquired some first-hand experience, and was certainly more conversant with the U.N than my brother Walter. Not too modestly, I gave him some advice about how to work the system, took him around and introduced him to some U.N. officials. He didn't have to wait too long for his little group of islands in the Pacific to become independent. There he was, Prime Minister of the Republic of Vanuatu, and I was still the same unknown entity with no country, no official status, no money, sharing a life in exile along with thousands of Tibetans, Burmese, Eritreans, Chileans, Filipinos, Paraguayans, Uruguyans, Ugandans – all who were fleeing their respective dictators.

What made Vanuatu's case an easy affair was that it was fortunate enough not to have Indonesia next door. The French and the British had co-exploited the islands and finally decided they had robbed enough, and departed, and nobody cared whether Vanuatu became independent. No such luck for East Timor. When the Portuguese began to withdraw from their former colony, Indonesia plunged into the breach, snuffing out the aspirations of a people who had long dreamed of freedom and democracy.

I arrived in New York early in December 1975, having escaped the invasion of Timor by a few days. That was my first encounter with the North American winter, my first sight of real snow, my first adventure to a big metropolis. Where I was born and grew up, in the mountains of East Timor, there were no cars except for the yearly visit by a Chinese merchant on his old truck, itself a major event for us children. I was transported from this to a centre of power and, as it turned out, the world of organised hypocrisy.

On December 7, 1975, Indonesia invaded East Timor. U.S. President Gerald Ford and his Secretary of State, Henry Kissinger, had been in Jakarta a few hours earlier conferring with Indonesian President Suharto about Asia-Pacific security after the fall of South Vietnam to the Viet Cong. The invasion of East Timor, now known to have been planned for December 6, was put off for a day, as a courtesy of the Indonesian dictator to his important guests. As a U.S. State Department official testified in 1977 to the U.S. Congress, more than 90 per cent of the weapons used in the invasion were American-supplied. The invasion would not have taken place had the U.S. president opposed the use of American weapons in the operation.

Portugal, then a backward Western power, had seen its empire crumble by 1974 after almost 500 years of colonial domination. It made faint efforts to support the Timorese. As the internationally-recognised administering power of East Timor, it called a meeting of the U.N. Security Council. In this, it was supported by the newly-independent Portuguese-speaking African states of Angola, Cape Verde, Guinea-Bissau, Mozambique and São Tome & Principe. Weeks earlier, as the Portuguese influence in East Timor dissipated, East Timor's largest political party, Fretilin, took power from the colonial administration and declared the territory independent. A government was installed, and to me fell the portfolio of Minister for External Relations. I was 25 then,

Sven Cooks

Left: Timorese civilians gunned down by Indonesian soldiers in the Dili massacre of November 12, 1991, huddle in East Timor's Santa Cruz cemetery.

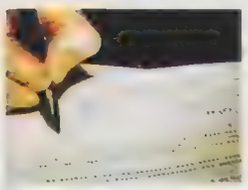
Above: Fretilin supporters parade in East Timor one month before the Indonesian invasion in 1975.
Below: A parade in Dili by some of the estimated 50,000 troops deployed by Indonesia in East Timor.

GREGORY BALDWIN

"I quickly learned that the U.N. was not an institution driven by the noble principles in its Charter, but a mirror image of the often conflicting national interests of its members."

probably the youngest and most naive foreign minister ever appointed anywhere. Hence, I was given the task of presenting our fledgling government's credentials to the U.N. By the time I arrived in New York, I was addressing the Security Council as the exiled representative of an extinguished government.

The Security Council was convened by the then British Permanent Representative, Ambassador Ivor Richard, an overweight chain-smoking barrister. With the help of Lisbon and the newly-independent Portuguese African states, I was able to attend and participate in the discussions in the Council, becoming thus the youngest person ever to address that august body. I was shy, intimidated, excited, euphoric and fearful. I had never addressed any formal forum apart from the mass meetings in my beloved island, and a few meetings with students and labour unions in Australia. The transition from the jungles of East Timor to the corridors of power of the U.N. couldn't have been more dramatic.



Surprisingly, China was our main ally in the Security Council. Relations between Jakarta and Beijing had been broken following the 1965-66 coup in Indonesia and the subsequent slaughter of almost a million civilians, many of them innocent Chinese merchants. The then powerful pro-Beijing Partai Komunisi Indonesia (PKI) was destroyed, its members massacred by then General Suharto's purge. Beijing waited in the wings for an opportunity to settle the score with Jakarta Indonesia's invasion of East Timor was this long-awaited time for revenge. Led by Ambassador Huang Hua, the Chinese delegation lent me full diplomatic backing and some very strong language was levelled at Indonesia. Huang Hua rightly called the invasion a "naked act of aggression". After our duties at the U.N., I would be lavishly entertained in the Chinese mission at Lincoln Centre by Huang Hua, plied with a never-ending supply of the finest Chinese cuisine and the inevitable *mau-tai*

Australian Foreign Minister Gareth Evans and his Indonesian counterpart, Ali Alatas, toast the signing of the Timor Gap Treaty.

It was obvious to all that the invasion of East Timor was a clear breach of the U.N. Charter. Despite Indonesia's spurious arguments to justify its intervention and its strenuous efforts to block the decision by the Council, a rare unanimous resolution was reached by December 22. This occurred in the face of the Cold War, the dramatic closing chapter of the Vietnam War – which seemed to confirm Lyndon Jonhson's domino theory – and the customary paralysis afflicting the Council by the veto power of its five Permanent Members. On the face of it, such a unanimous decision was remarkable

I was pleased. There I was, 25 and the youngest foreign minister in the world and the youngest person ever to take part in a Council meeting, holding in my hands Security Council Resolution 382. The resolution affirmed our right to self-determination and called on Indonesia to withdraw all its troops from East Timor "without delay". Only Israel, the Council's favourite whipping boy at the time, had ever attracted stronger language. It was a grand moment.

Departing Dili on December 4, I had promised to return in a few weeks. Armed with the Security Council resolution, I knew I would return to our family's modest tin-roofed and palm-tree house in Dili within days. The Council would demand that Indonesia comply with its resolution and, failing this, the world community would amass a military force, as provided in the U.N. Charter, and drive Indonesia out of East Timor

Nineteen years later, I am still waiting.

That was the year that my schooling in international hypocrisy began. I quickly learned that the U.N. was not an institution driven by the noble principles in its Charter, but a mirror image of the often conflicting national interests of its members.

Permanent Members of the Security Council – the United States, Russia, China, Britain and France – are not only the ones to blame for the corruption of the U.N. system, as many think. Small, medium and large countries also place their perceived national interests above the principles and purposes of the U.N. Even the nicest of little countries help undermine the system. Former New Zealand Prime Minister David Lange, in the last issue of '21•C', castigated the U.N.: "What has happened in Bosnia is a powerful message to the world that countries which don't have oil, don't block an international trade route, or don't have nuclear secrets, hold no real interest for the Great Powers...."

This is the same man whose government consistently voted on the side of Indonesia at every U.N. General Assembly resolution on the issue of East Timor. Even the mildest resolution, General Assembly Resolution 37/30, which mandated the U.N. Secretary-General to open a dialogue between Portugal and Indonesia to resolve the conflict in East Timor, met with strong opposition from friendly New Zealand. Don't get me wrong, David Lange is a nice guy. But I would have expected better from the government of such a morally upstanding man

The Timorese people have been battling such hypocrisy since the invasion. High-sounding declarations and back-room deals. Security Council resolutions that no-one has the stomach to pursue. I have even been approached for a bribe from a Commonwealth ambassador in order to secure a favourable vote. The going rate is US$2,000.

Indonesia is an economic dynamo, with a population of 180 million and government that has long been a bulwark against the spread of communism. Compared to Indonesia, what is neighbouring East Timor but an underdeveloped island populated by a mere 750,000 people. And anyway, Indonesia has a taste for expensive military purchases, of the kind that keep British and American workers employed in skilled jobs

There is one place where the hypocrisy can be short-circuited, and it may yet come to the aid of East Timor. The International Court of Justice at The Hague will hand down its verdict on the Timor Gap Treaty sometime in 1995. Portugal took Australia to the World Court in 1991, arguing that in entering into a treaty with Indonesia for the exploitation of oil in an area that – under international law – Indonesia does not rightfully control, Australia was in violation of its international obligations.

Australia stands a good chance of losing. The U.N. has never recognised the forced annexation of East Timor, and only a few countries – Australia notable among them – have accepted Indonesian rule there. If Australia loses, it stands to pay millions of dollars in compensation, and the treaty will be invalidated, triggering a rash of compensation claims from the seven international oil companies now exploring in the rich seafloor between Australia's northwest and the southern coast of East Timor.

It will be interesting to see whether David Lange will call for Australia's expulsion from the U.N. if Canberra does not comply with the decision of the World Court, as he has argued non-complying member states should.

But how about countries like Indonesia that defy Security Council resolutions? Shouldn't they be expelled too? New Zealand is currently supporting Indonesia's bid for a seat in the Council even though Indonesia is in defiance with two binding Security Council resolutions and eight General Assembly resolutions over its occupation of East Timor. Why such duplicitous policy?

I have little hope that the U.N. can fully live up to the lofty principles enshrined in the Charter. The only hope for peace and justice in the world come from the tireless crusade of the common citizen. The mighty Soviet military arsenal did not prevent the break-up of the Soviet Union, the freedom of the captive Baltic and Eastern European nations, and the dismantling of the Berlin Wall. The tanks of Ferdinand Marcos and Nicolau Ceacescu could not hold back the demands of Filipinos and Romanians for freedom. The Eritreans fought a dogged battle of resistance against Ethiopia for 30 years while all around them said it was a hopeless struggle, saying that Eritrea's annexation was irreversible, yet Eritrea last year won its freedom.

Individuals can make a difference, and East Timor stands as an example of this. We have survived Indonesia's brutal occupation, American, French and British complicity, the hypocrisy of countries like Australia and New Zealand that have put mercantile goods above morality and justice – none of this has crushed the Timorese will to be free, their desire to shake off their occupiers.

The U.N. has been largely ineffective in dealing with Bosnia-Herzegovina, Somalia and Rwanda. But not because its bureaucracy is bloated and overpaid, as Lange argues. In truth, it has some dedicated and outstanding individuals who cannot do more because their hands are tied by member governments. Lange's tirade against the U.N. should be aimed at countries like his own and Australia, as well as the Great Powers. East Timor, after all, is an issue that can hardly be said to be as complex as Bosnia. Even small efforts by Wellington and Canberra would go a long way in encouraging the U.N. Secretary-General to do more for East Timor.

The U.N. has been largely impotent because countries like the U.S., U.K., Germany, Japan, France, Australia and New Zealand all have their eyes on Indonesia's lucrative market. If large powers corrupt the U.N. system, small countries like New Zealand and Australia should join forces to uphold the Charter, at least in small ways. An alliance of small countries and an aggressive stand on human rights might not do much to help the Bosnians, but it can make a big difference to the Timorese.

Unfortunately, the truth remains that the U.N. has been largely ineffective, and part of the blame must be levelled at the governments of small nations like Australia and New Zealand, which do not, it seems, have the dignity nor courage to stand up to the big bully of the region, Indonesia.

New Zealand has not been indifferent to the East Timor tragedy. This by itself might have been some small good. The reality is that New Zealand has actively connived with Australia to suppress information about East Timor, to cover up the ugly truth, to deceive its people because admission of the truth would put in question the very policies in the pursuit of national interest that Lange now so stridently derides.

Only the dedication of common citizens around the world – students, academics, journalists or just ordinary folk – have kept the issue of East Timor alive. One of the strongest ironies is that, while their governments have connived to extinguish freedom in East Timor, Australians, Britons, New Zealanders, Americans, the Irish, Canadians – these have been the biggest supporters of the Timorese, and have lent their time and energy to the cause, joining with the 15,000 Timorese around the world who managed to escape the invasion.

If it were left to David Lange, Bob Hawke or Paul Keating, the issue of East Timor – surely a test case for the principles of the U.N. Charter – would have long ago been buried, and would have ceased to disturb their good Western liberal conscience. But like the great Jewish and Armenian peoples that survived centuries of hatred, persecution and genocide, the people of East Timor will reach the top of Mount Ramelau and from there, like Martin Luther King, they will see a new world of peace and freedom.

I have no doubt that East Timor will be free before the end of the decade. The forces of history that brought down the Berlin Wall, toppled Ferdinand Marcos from power in the Philippines and brought Israel and Palestine together, are making things difficult for Indonesia. Sooner or later, Indonesia will have to yield to growing international pressure, which is so much stronger now that the Cold War is over. Of this I am certain.

Oliver Stewart

Timorese guerrilla leader Xanana Gusmão in happier days. Indonesian troops captured him in 1992 and he now sits in the high security Cipinang prison in Java.

"I have even been approached for a bribe from a Commonwealth ambassador in order to secure a favourable vote. The going rate is US$2,000."

PRINCE CHARLES CONSIDERS WILL BRINTON IS THE COMPOST KING, AS DOES THE WALT DISNEY CORPORATION. BUT BRINTON'S BIGGEST CHALLENGE IN THIS POST-COLD WAR ERA IS USING HIS COURT OF MICROBES TO MUNCH DOWN THE PENTAGON'S WASTE – WEAPONS.

the king of compost

BY ADAM L. PENENBERG

America's defence budget is shrinking, its military bases are shutting, and the Cold War seems as relevant as a '60s sitcom. So what's the problem? Just this: What to do with millions of tons of sludge contaminated with TNT and piled skyward at abandoned military bases.

Enter Will Brinton, aka "The Compost King", master in the art of nature's own garbage disposal system, compost advisor to the Prince of Wales, Walt Disney World in Florida, and the U.S. Pentagon ("You'd be amazed how many Disney engineers are ex-military," he says. "It's spooky."). In short, a man who makes his living by turning poison into plant food.

Brinton concocts recipes to titillate microbial tastebuds and induce naturally occurring bacteria to gobble up pollution. It can take weeks to come up with a suitable mix of ingredients, a sprinkle of this, a pinch of that, until the hazardous can be alchemised into the harmless.

"In the past we built bombs. Now we compost them," says Brinton, who has concluded three composting projects for the U.S. military. "Instead of building ploughshares from weapons, we're actually building soil."

But Brinton's magic does not end with transforming TNT into terra firma. At Woods End Laboratories of Maine, an outpost in the field of compost, he and eight assistants, working out of a renovated horse barn, invent recipes to break down even stubborn toxins like pesticides, industrial polymers, paper-mill sludge and animal manure. And in recent years, while American landfills have begun to overflow and local laws dealing with hazardous waste disposal have become stricter, business has boomed.

Walt Disney World, forced to comply with Florida's tough mandatory-recycling law, hired Brinton to plan composting projects able to handle thousands of tonnes of discarded food at a time. The Prince of Wales, himself keenly interested in environmental issues, has conferred with The Compost King on a number of issues, including the creation of a compost program for The Duchy of Cornwall, the farmland owned by the prince.

Other clients, like petrol station owners pressured to clean up contaminated oil around petrol tanks, and New York City's solid-waste agency, are looking at composting as a cheap alternative to hazardous-waste disposal, which currently exceeds $100 a tonne in the U.S.

"It's significantly cheaper to compost than to dispose of as hazardous waste," says Brinton, 40, an agricultural chemist who studied organic farming in Europe. "All you need is a bulking agent such as straw, wood chips or sawdust, and an energy source, like nutrients in food or manure. Those are the primary needs – assuming the necessary microbes are already there."

Every project begins with careful analysis of the materials in question. The cook-chemists then add a touch of this, a drop of that, to the toxins in cauldron-like "bench composters", searching for chemical reactions that indicate bacteria are merrily scarfing down the mess – but without making too much of a stink. Public acceptance of composting, Brinton maintains, means keeping the aromas of decaying matter to a minimum.

Success has afforded Brinton the opportunity to turn the earthy activity of composting into a hi-tech endeavour. Complex computers calculate the effect ingredients such as chicken manure or sawdust will have on toxins, while other machines measure plant nutrient levels.

Despite these advanced techniques, finding a solution for TNT was tricky.

"You have to be careful with TNT," Brinton says, "because composting can produce an intense amount of heat, which is the last thing you want with explosives. You still have to let it heat up, but not too much."

His easy-to-follow, "mix, rake and bake" recipe for TNT disposal went roughly like this: Carefully blend a ton of plant waste from a nearby mint-processing factory with the TNT sludge. Stir well. Sprinkle in one ton of carbon-rich sawdust from a local lumber mill. Let stand. Spoon in a ton of buffalo manure. Let sit for 30-90 days, stirring daily.

Another recipe, courtesy of Cafe Brinton, removes ink stains from landfills. A by-product of the information age, ink from newspapers, magazines, copiers, faxes, and laser and ink jet printers can be found wherever there are people. Its critical ingredient, PAH (Polycyclate-Aromatichydrocarbon), also causes cancer. Brinton's magical elixir: shred newspapers, out-of-date phone books, Yellow Pages and scrap paper. Knead into *in situ* dairy-farm manure. Have mixture trampled underfoot by a herd of cows. Feed to crops.

"Composting hazardous waste is no panacea," Brinton warns. "Although the final material seems to be non-toxic and benign, after we compost TN, we cannot account for as much as three-quarters of it. Because of these uncertainties, it will need to be studied for at least another decade."

Which goes to show: ultimately the best way to deal with hazardous waste is to not produce it in the first place. ■

TURNING AN ENVIRONMENTAL DISASTER INTO AN ECONOMIC RESOURCE IS NO LONGER JUST A GREENIE'S DREAM – IT IS A CORPORATE INITIATIVE.

slick oil

BY ADAM L. PENENBERG

Could the Exxon Valdez disaster in Alaska have been solved with chewing gum, oats and aluminium foil? Surprisingly, yes.

Spurred by the Oil Pollution Act of 1990 (OPA), passed by Congress in response to the Exxon accident, American companies are using just these materials to create cheap, effective and environmentally safe oil-spill cleanup technologies.

For the oil-cleanup business, already a US$1 billion industry, the law, which requires those who spill oil to clean up the mess – or face staggering litigation – has created a potentially booming market for innovative technologies. And for the U.S., a country plagued with 16,000 reported oil spills every year (and which some environmentalists estimate *loses* more oil annually through accidents and negligence than Australia *consumes*) the law is seen as a much-needed plug to a serious leak.

Until recently, cleanup contractors have relied on the decidedly low-tech: skimmers, oil-munching microbes, sorbents – which are "like throwing paper towels on a spill," says one cleanup contractor – burning oil at open sea, and even rags (for petroleum-soaked coasts). At best, these methods recover only 20 per cent of an oil spill, the rest is left to evaporate, soak into the ecosystem or float out to sea with the tide

Fortunately, new technologies offer recovery rates well above 90 per cent. One new product is Elastol, marketed by General Technology Applications. When Elastol, made from polyisobutylene (chewing gum stuff), is applied to a spill, it turns the oil into a thick layer – like the skin on hot chocolate – that can be literally pulled off the water's surface by a spinning drum. This scum can then be churned in a pumping system which breaks down the polyisobutylene and returns the oil to its former state.

"We estimate that 97 per cent of the oil is recoverable," says Jerry Trippe, president of the Virginia-based company.

Elastol has been successfully deployed on a number of occasions. Last year, after a ruptured pipeline leaked oil into the Potomac River in Fairfax County, Virginia, Elastol was used to pick up an estimated 75,000 gallons of oil. And twice a week, in Brooklyn, New York, it is applied to an oil plume that has been seeping for decades into Newtown Creek from an abandoned refinery.

"With the aid of Elastol, we pick up the oil and ship it back to the company twice a week, where it's recycled instead of being disposed of as hazardous waste," says Jack Scambos, a consultant who manages the cleanup project. "It's time to throw away the paper towels. We have a technology that saves time and money and eliminates the need for disposal."

A second novel approach involves slurping up oil with sponge-like nuggets, then feeding it to hungry bacteria. While concocting skin-care lotions in a laboratory in Missoula, Montana, it occurred to chemists of Nurture Inc. that if oats can soak up oil from acne-riddled skin, why not crude from a massive slick as well? Specially treated pellets sop up the oil, then are dispersed by waves and tides. By providing tasty nutrients for microbes, the slick is eliminated naturally.

"The natural oil in the oats has been removed so the pellets are hungry for oil," says James Castro, a research chemist with Nurture. "It disperses three to five times its weight in oil, which is equal to the liquid chemical dispersants in use in Europe, but which are illegal here in the U.S. due to their toxicity."

Nurture's chemists claim that the company's product is 100 per cent environmentally safe. "You'd have to add more Nurture than fish food to kill fish," Castro says, "and since it makes oil less available to fish, it even mitigates the oil's toxicity."

A third option relies less on chemistry or biology and more on smart engineering. Superator, exclusively licensed to Environmental Recovery Resources of Salem, New York, is a lightweight aluminium skimmer that's a winner. Due to its unique design – like an airplane wing – its skimming action forces water out from under collected crude, gradually jellifying the oil until it can be whisked away. An upstart in the U.S., but used widely in oil-marinated Eastern Europe, Superator provides for 100 per cent cleanup of tainted waterways.

Unfortunately, in the U.S. it's nearly impossible to even test these technologies on real-life spills, let alone deploy them. The process for bringing spill-remediation products to market involves a winding, intricate maze of committee meetings, paperwork, tests and presentations, ultimately requiring rubber stamps of approval from some local, state and federal regulatory agencies.

But in the long run, the OPA may provide its own catalyst for change. Says Trippe: "Before the Oil Pollution Act, there was no market for products like Elastol. But the law has put spillers at greater risk than ever before. Technologies like Elastol reduce liability: If you catch the oil before it causes greater damage, you diminish liability.

"And this," he adds, "is an effective way to reduce cost."

Which, as often is the case, may prove to be the deciding factor. ■

COMPILING INFORMATION, FROM THE INTERNET TO DATA FROM MARS, REQUIRES STAGGERING STORAGE SPACE AND SUPERFAST PROCESSING. THE INFOSILO IS THE SOLUTION TO THE AWESOME INFORMATION OVERLOAD.

info silo

BY BILL D'ARCY

Scientists are moving decisively to bring order to the information superhighway where the growing deluge of digital traffic is creating a chaotic traffic jam.

One of two facilities outside the U.S., the huge storage and transit silo in Australia's capital, Canberra, is capable of holding almost a petabyte, or 1,000 terabytes (one thousand million megabytes).

The multi-million dollar facility will reduce the superhighway's information overload by storing a vast quantity of digitised data and providing both scientists and the public easy access. The data silo has been installed at the Australian National University (ANU) under a Research and Development agreement with the U.S.-based Storage Technology Corporation (StorageTek).

A robotic arm manipulates 6,000 uncompressed 50 gigabyte (150 gigabyte compressed) magnetic tapes stored in a 12-sided silo. The robot mounts tapes in six read/write drives without manual intervention.

"It will hold between 100 and 250 times the amount of text stored in the Australian National Library (8,000,000 books) and between 400 and 1,000 times that in the ANU library," says the head of ANU's Supercomputer Facility, Dr Bob Gingold.

"It would also store about 100,000 full-length movies in JPEG compression, with an access time of less than a minute." The data silo is being used to hold and archive supercomputer output for easy retrieval and analysis.

Gingold says this covers most of the physical, chemical, biological and environmental sciences, with silo priority being given to organisations participating in projects with the ANU, including the multimedia Hansard project.

"You'll be able to watch a politician giving a speech while reading the text which is linked to other relevant documents," he says.

Climate modelling, containing baseline calculations on matters such as barometric pressure, temperature, wind and rainfall, is being stored for later use. "In monitoring global change and building models, data has to be calibrated, sorted and stored in such a way that it can be accessed in 20 years time so that we can see what is happening," Gingold says.

Global monitoring by the Earth Observing Satellites, a joint project being run by the ANU's Geography Department and the CSIRO's Office of Space Science Applications and Division of Wildlife and Ecology will also be stored in the silo. "These satellites will soon be transmitting one terabyte a day," Gingold says. "A lot of the data that is currently gathered by Earth observatory satellites is thrown away because there is nowhere to store it."

The Mt Stromlo 'dark matter' project, in which astronomers are searching the universe for missing matter such as black holes and dead stars by looking for light variations, will be accessible. "Several hundred gigabytes of data are required on line for quick decision-making," Gingold says. The Australian Co-operative Supercomputer Facility project – involving the ANU, all the universities in the Sydney and Adelaide regions, Monash University, the CSIRO, and the Defence Science and Technology Organisation – is exploring ways of sharing a "true" supercomputer. "There are no true supercomputers in the country at the moment," he says. "Part of the ANU's contribution is access to the silo."

Possible future uses include storage of digitised video on a vast range of scientific experiments and procedures that are expensive, difficult or impossible to replicate. These could cover complex surgical procedures carried out by experts, with doctors worldwide accessing the images on their work stations.

ANU and StorageTek are establishing an R&D agreement covering software development in areas related to massive data-storage and high-speed retrieval. Scientists from both organisations are now developing the details of the joint R&D projects to be carried out. The StorageTek R&D laboratory in Canberra is one of two outside the U.S. ANU scientists will be working closely with researchers at this laboratory as well as in StorageTek's headquarters in Louisville, Colorado.

Both parties see great potential for joint research in an area expected to be one of the most important for computer technology over the rest of the decade.

"We're looking at how to navigate around large amounts of data sets and pick out the data that you want and its information links," Gingold says.

The ANU's vice-chancellor, Professor Deane Terrell, says the data silo is the first device with storage on this scale installed by any Australian university.

"The data silo will enable our scientists, for the first time, to work in areas of data-intensive research that previously could only be done overseas.

"It complements the major investment that ANU has made in advanced computing over the past decade or so." ■

THE MINI-SKIRTS MAY HAVE BEEN DISCARDED, BUT *STAR TREK* – IN ALL OF ITS INCARNATIONS OVER THE PAST 30 YEARS – HAS ALWAYS HAD A HANG-UP ABOUT WOMEN. BUT IT MAY BE ENTERING A NEW FRONTIER.

where no woman has gone before

BY JOHN MORRONE

"Hailing frequencies open, Captain." In the version of the 23rd century as it was imagined in 1966 – the not-quite-utopia-but-we're-trying world of the original *Star Trek* – the leggy Lieutenant Uhura performed her duties as the starship's communications officer with all the efficiency and aplomb of an interstellar switchboard operator. Almost every week, she would open those hailing frequencies, record Starfleet testimony on her tricorder, or cut through subspace interference like a pro. But, as warmly as she was portrayed by Nichelle Nichols, Uhura was also called upon to gasp, scream, and occasionally sob, "Captain, I'm frightened". And do it all in a mini-dress. What's wrong with this picture?

It's tempting, in hindsight, to deride our outmoded visions of the future, especially those that took the form of popular entertainment. While the works of, say, H.G. Wells continue to possess the cache of literary character, the jingoism of a Flash Gordon now seems charmingly passe. *Star Trek* is another matter. Still immensely popular, a vivid lure for imaginations young and old, and a cash cow for Paramount Pictures, *Star Trek* continues to evolve in a multitude of forms that includes new television episodes and re-runs of old; feature films; a line of videos; an inexhaustible number of fanzines and novelisations; and, now, the creation of a new series, *Star Trek: Voyager*, debuting in the United States in January.

23rd Century Woman: Kate Mulgrew

Cut the show's writer and producers some slack: they've made social and cultural progress as we all inch toward the real future. In the *Star Trek* of the 1990s, racial diversity – not to mention a dazzling array of species from distant planets – is still much in evidence. The plots often chastise the blinkered interference of bureaucrats that places limits on Where No One Has Gone Before, and what you can do when you get there. Nevertheless, sex roles and stereotypes remain problematical.

Star Trek at millennium's end no longer inflicts on viewers such ludicrous women characters as the fire-eating royal virgin Elaan of Troyius, or Shahna, a six-foot Amazon in a silver brassiere. These comic-strip viragos and bimbos are easy targets, and we can dismiss them from the known universe. Far more disheartening has been the stockpile of discarded women characters who were either too intelligent or too powerful to stay in the *Star Trek* universe without undermining the Old Boy shenanigans of Captain James T. Kirk's weekly womanising. Carol Marcus, Lieutenant Saavik, Number One, Valeris – all are names fans remember fondly, but producers prefer to forget. And despite *Star Trek*'s famed multicultural bias, it's intriguing to note that there appear to be no homosexuals, male or female, in the 23rd century. Although two *Star Trek: The Next Generation* episodes flirted with the idea very indirectly – in a pair of stories about species whose sexual identity and orientation were ambiguous – it's been clearly too much of a stretch for Paramount to safely beam even a few gay Starfleet cadets into our living rooms.

The women of today's *Star Trek* – though allowed more resources and responsibility than their predecessors – are forced to run a tricky course. A tough time is had by the women who serve on the bridge of the Enterprise – the new Uhuras, so to speak. Typically, they are given far too little to do, and in the case of security officer Tasha Yar, played by Denise Crosby as a series regular during the first season of *The Next Generation*, her role was so under-utilised that the actor resigned and the character was killed off. The Enterprise's chief medical officer in NextGen started out as Dr Beverly Crusher (played by Gates McFadden), a character intended to add a twist of sex appeal to the buddy-buddy relationship between captain and doctor we'd seen in "classic" Trek's Kirk and McCoy. The sauce didn't thicken, though, and Crusher was replaced by Dr Pulaski, a feisty old bird played tartly by Diana Muldour. The character showed terrific potential, but producers leaked that Muldour was too bossy. A year later, Pulaski was gone and Beverly was back: solid, maternal Beverly, who practises 23rd century medicine with preternatural calm and hardly ever raises her voice.

One of the most provocative women yet seen on the Enterprise was Ensign Ro Laren, a freedom fighter from the planet Bajor whose guts, beauty and temper curried unusually strong favour among fans for a character who appeared only occasionally. Offered a regular part in the spin-off *Star Trek: Deep Space Nine*, actor Michelle Forbes declined in order to pursue a movie career, and one wonders whether she sniffed out a potentially frustrating deal from Paramount. The producers learned from their loss. Forbes was recently invited back for a first-rate NextGen episode built entirely around Ro. And the slot Ro was to have had in *Deep Space Nine* was re-tooled to introduce another Bajoran, Major Kira: aggressive, emotionally vulnerable, and utterly direct, she is perhaps DS9's most successful employee. In her hands, the 23rd century looks very promising.

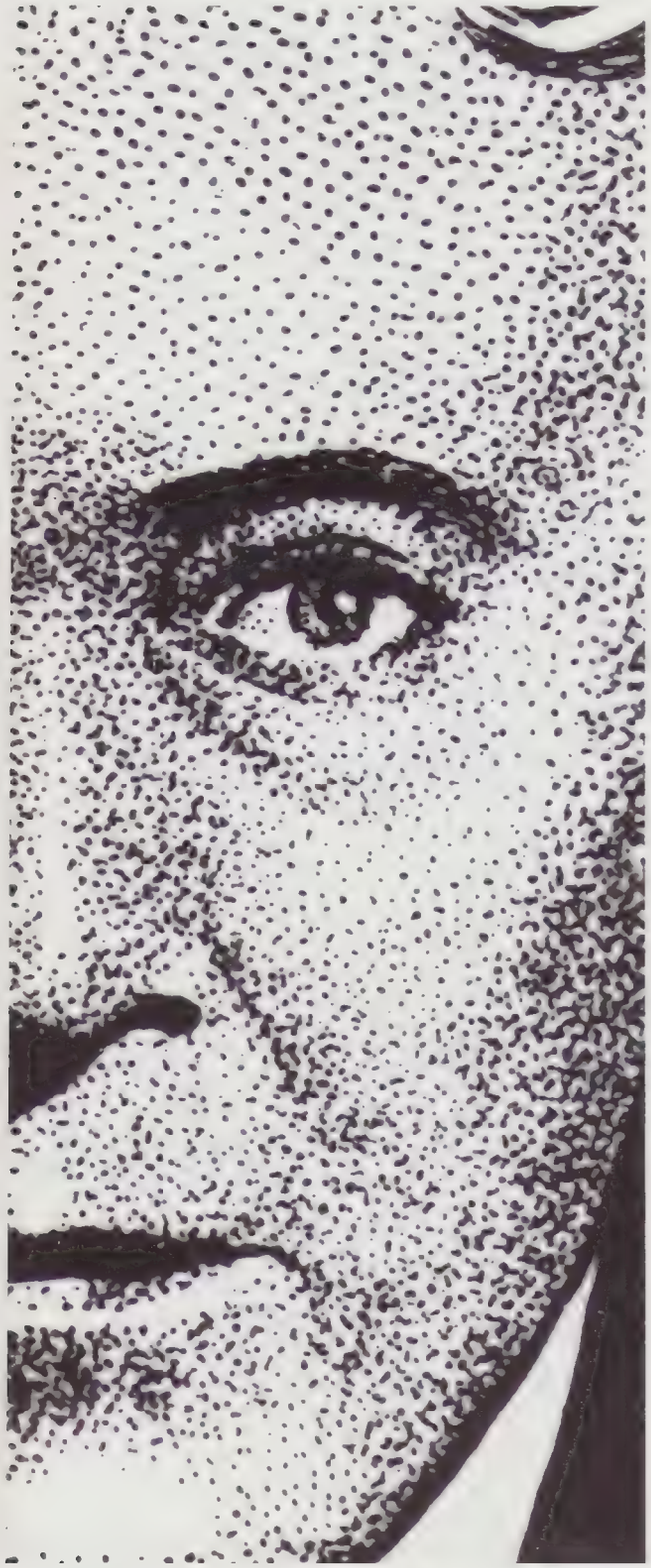
Even with improvements, is *Star Trek* still a Boy's Own Space Story, or is that orbit decaying? The rumour mill has been grinding tirelessly over the seventh and latest feature film, *Star Trek: Generations*. By concocting a time-travel plot, the writers unite Captains Kirk and NextGen's Jean-Luc Picard in an adventure that includes only two others of the original Enterprise's crew, Scotty and Chekov. Uhura does not appear. (Lucky for Nichelle Nichols: more time to promote her newly-published memoirs, *Beyond Uhura*, in which she elaborates on her favourite moments in *Star Trek*: "Anything that got Uhura off the bridge!")

Voyager offers what some see as a radical departure: a woman commanding a starship on a weekly basis (We caught a glimpse of a woman captain in *Star Trek IV*.). To play Captain Kathryn Janeway, says television veteran Kate Mulgrew, will be "a pleasure, but it's a little bit [like being] shot out of a cannon". In photos and on-the-set clips released by Paramount, Mulgrew cuts an imposing figure: tall and sleek, a concentrated look on her bright Irish face framed under an upsweep of big hair. But she's only doing what men in the 23rd century have been doing for years. What took Paramount so long? Didn't they hear the hailing frequency? ■

AMONG THE LEGION OF BIZARRE AND POPULAR PROPHETS IS CRISWELL, THE NOSTRADAMUS OF HOLLYWOOD, WHO PREDICTED MANY THINGS, EXCEPT HIS OWN RESURGENCE AS A CULT FIGURE IN THE NEW TIM BURTON FILM, *ED WOOD*.

future schlock

BY MARK NEWGARDEN ■ ILLUSTRATION BY DREW FRIEDMAN



"Greetings, my friends! We are all interested in the future for that is where you and I will spend *the rest of our lives!* And remember my friends, future events such as these *will* effect you in the future!" So intones the deadpan, swirly-coiffed, doughy-complexioned seer-in-a-tuxedo. Criswell, at the outset of Ed Wood's 1959 zilch-budgeted 'masterwork' *Plan 9 From Outer Space*.

Once again, these immortal divinations echo through the cinemas as Jeffrey Jones as Criswell, delivers the prologue to the Tim Burton biopic *Ed Wood*, straight from the interior of a well-upholstered coffin (a location with which Criswell was extremely familiar).

Burton's film chronicles the salad days of Edward D. Wood Jr, a zealous if not particularly exacting visionary who struggled to make films, by any means necessary, during the waning hours of the Hollywood studio system. Despite the often unjust tag as "the world's worst movie director" Wood's canon, which includes such stunning peculiarities as *Glen or Glenda?*, *Bride of the Atom*, *The Sinister Urge*, *Jailbait* and *Orgy of the Dead*, has proven enormously commercial over the years, although not for Wood, who died in obscurity in 1978.

Central to any understanding of the Ed Wood mythos (as is so well reflected in Rudolph Grey's entertaining oral history, *Nightmare of Ecstasy*, 1992) is the omnipresent Wood entourage with whom he worked, partied and dreamed. The reigning stars of this sideshow stock company were the elderly, formaldehyde-imbibing ex-Dracula, Bela Lugosi; Tor Johnson, "The Super Swedish Angel", a lumbering 400 lb. professional wrestler; Maila Nurmi, alias L.A. TV's blacklisted spook movie hostess "Vampira"; plus sundry transvestites, transsexuals, has-beens, wannabes, and Criswell.

The prophet Criswell (born Charles Jeron King Criswell in Princeton, Indiana) was, next to Lugosi, perhaps Wood's most recognised mainstream "superstar": a widely syndicated columnist, author of two volumes comprised of his "visions" and a frequent guest during the early days of Johnny Carson's *Tonight Show*. Criswell seemed to have capitalised on his powers fairly late in life (although he claimed that his first uttered words were a valid prediction: "The rain will stop!" during a thunderstorm at the age of four). Only after various incarnations as an undertaker, morgue attendant, ambulance driver, reporter and TV newscaster did he finally find his true calling. Caught short during an evening broadcast, Criswell began to improvise, predicting the next day's headlines. To everyone's astonishment, Criswell included, his forecast proved accurate enough to inspire a new career path, and the Nostradamus of Hollywood Blvd was born.

In an especially amusing scene in *Ed Wood*, set in a period Hollywood nightspot, Johnny Depp as the ecstatic young filmmaker, marvels at Criswell's ability to predict future events. "It's horseshit," Jeffrey Jones blandly banters. "I make it up."

Any critical examinations of Criswell's predictions reveal that, as with Ed Wood, what captivates us now is not his visionary acumen (he routinely claimed an unlikely accuracy rating of 87 per cent), but his out and out failures. Not merely bad guesses, Criswell's predictions are at best stupefyingly absurd flights of fancy: straight-faced, woe-filled and utterly goofy. What follows are some of Criswell's true gems, culled from the pages of *Criswell Predicts From Now to the Year 2000!* (1968) and *Criswell Predicts Your Next Ten Years* (1969).

Homosexual Cities!

"I predict that perversion will flood the land beginning in 1970. I predict a series of homosexual cities – small, compact, carefully planned areas, will soon be blatantly advertised and exist coast-to-coast... the homosexual capital will be Des Moines, Iowa, the bisexual capital will be Pasadena, California and the heterosexual capital will be Eerie, Pennsylvania."

The Boy Scouts

"I predict that the Boy Scouts of America will be denounced in Congress... as nationalistic, fascistic and bent on 100 per cent destruction of American rights!"

"I predict that the latest teenage craze is to openly steal a dead body..."

"I predict that perversion will flood the land beginning in 1970"

Aphrodesian Era
(May 1, 1988-March 30, 1989)
"I predict that our own U.S. will be swept by the popular clouds of an aphrodesian fragrance... invented by a scientist who is searching for an improved antiseptic spray... the aroma will fill every man and woman with uncontrolled passion...In Hollywood sex acts will be performed openly and unashamedly on the streets... A young man in Arkansas will ask to be legally wed to his pet cat."

Hatching Jackets
"I predict insulated hatching jackets for pregnant women...They will be smartly tailored in all the decorators colours to match the eyes and complexion!"

Eyes Turn to Jelly
"I predict that one of the top secrets of our Pentagon will be a potent gas, which can be sprayed over a city, causing all of the inhabitants to have their eyes turn to jelly!...All mankind is basically depraved!"

Loss of human hair: St Louis
(February 11 – May 11, 1983)
"I predict that on a summer's day women will find themselves facing a situation over which they have no control... I predict women will lose their hair... divorce courts will be swamped with irate husbands seeking freedom from their bald-headed wives!"

The cannibal cookbook
"I predict that the bestseller of the 1970s will be *The Cannibal Cookbook!* With the rise of African culture, habits and living patterns, the consumption of human meat will be a commonplace thing – by other humans!
A strange and loathsome cult will come out of Patoka Indiana... crazed men, women and children will raid the morgues where bodies are kept at frigid temperatures, steal the bodies, and devour them.
They are brittle and can be eaten like crisp ice-cream cakes. Delightful, delicious, human flesh! ...this cult will be known as "The Frigids". Even the bones will be eaten. And a rare delicacy will be the skull of anyone under 18!"

Destruction of Denver, Colorado
(June 9, 1989)
"I predict Denver will be the victim of a strange and terrible pressure from outer space, which will cause all solids to turn into a jelly-like mass... Needles will not penetrate flesh... A penny arcade will become a dungeon of doom... the citizenry will find themselves enveloped in a jelly-like substance that was once brick, concrete, steel and lumber..."

Shocking Teenage Craze
"I predict that the latest teenage craze is to openly steal a dead body...dress it up and take it riding in the front seat of a car. You can expect many arrests on this fun new fad..."

"I predict that during the next 10 years we will be faced with what historians will call "the automatic atomic plague"

The Automatic Atomic Plague
"I predict that during the next 10 years we will be faced with what historians will call "the automatic atomic plague"...SYMPTOMS: slight chills due from poor circulation. Certain dizziness and loss of balance! Cravings for pastry, rich gravies, confections and candy. Skin blotches of purple, shortness of breath and tired aching muscles will be followed by the abdominal muscles giving way and the intestines dropping to the floor, completely unattached! TREATMENT: The patient should take to bed at once for a period of an hour, then must walk an hour to restore circulation. After the third day the intestines drop to the floor, and the abdomen is open, bleeding and could mean a certain fatality in some cases, but in others the intestines remaining grow back together as Mother Nature mends." ■

BLENDING SUBSTANCE WITH SURFACE, BLENDER AND SUBSTANCE ARE JUST TWO OF THE NEW MEDIA OF SUBCULTURAL CD-ROMS.

rom with a view

BY ANDREA MOED

The magazine of the future will have its own theme song. Maybe that's not the most stirring prophecy you've heard about entertainment's coming Age of Five Hundred Channels, but to magazine fans, it offers a clue to how this centuries-old form may survive the multimedia revolution semi-intact.

Like the people who used to bring us books, magazine publishers are discovering CD-ROM and the joys of adding sound and video to their words and pictures. Much of their effort has been devoted to established titles, yielding 'shovelware' products like *Newsweek Interactive.*

Far more interesting, though, are 'digizines' – magazines designed from the outset to be published on disc. In the past year, several digizines have been launched by young and pop-culture obsessed teams of editors, designers, and programmers. Having grown up with MTV and come up through the club scene, they are self-conscious formal innovators with a healthy indifference to literary taste. You'd have to be, to come up with the disco ditty that plays during the startup of one digizine:

"It's everything I ever wanted to know (Blender...)
It's every place I ever wanted to go
This is where the action is... Blender magazine.
When the winter rain is falling outside
I take an interactive ride
On a spinning carousel
It spins me down to Hell Or to the gates of Paradise..."

As this plays, *Blender's* 'cover' image appears on the screen. A click of the mouse takes you to a map that functions as a table of contents, listing departments and features. The map reveals a structure not unlike that of a print magazine. There is a music section with reviews divided into genre types like "Commercial Alternative" and "Make Mine Funky"; several long articles including an interview with punk figure Henry Rollins; regular columns and a catchall section called "Icebox". Upon reaching the articles, however, the rules begin to change. Long pieces are presented as menus of topics that you can access in any order. Music plays as you read a record review. The Rollins article invites you to follow the interviewer on a tour of Rollins' home. By the time you have spent 10 minutes with *Blender,* it feels much more like wandering around a new place than like reading – a common feeling with digizines.

In *Blender* as well as in the digizine *Substance,* that place seems to be a club or cafe in a trendy neighbourhood. The 'zines are subcultural strip malls that radiate out from 'alternative' music to satellite concerns like *Blender's* fashion, food, and comics, and

Substance's software and independent film. Graphics provide the 'atmosphere' that merges the disparate scenes into one, mixing visual sources from Pop Art to psychedelia.

The *Blender* aesthetic is that of a kiddie cartoon, with Day-Glo colours and little animated doodads everywhere. Surfaces seem to be made of Super Elastic Bubble Plastic: their glossy, globular forms set off a multitude of video windows and bold line art. *Substance* has a darker, more contemplative feel, with lots of sci-fi imagery and new agey crystalline shapes, all floating in a ubiquitous purple haze. True to its name, *Substance* contains fewer and more in-depth articles than *Blender,* including an exploration of ambient house music with reviews of 130 albums, and a multi-tentacled piece about the band Nine Inch Nails, including several long video clips.

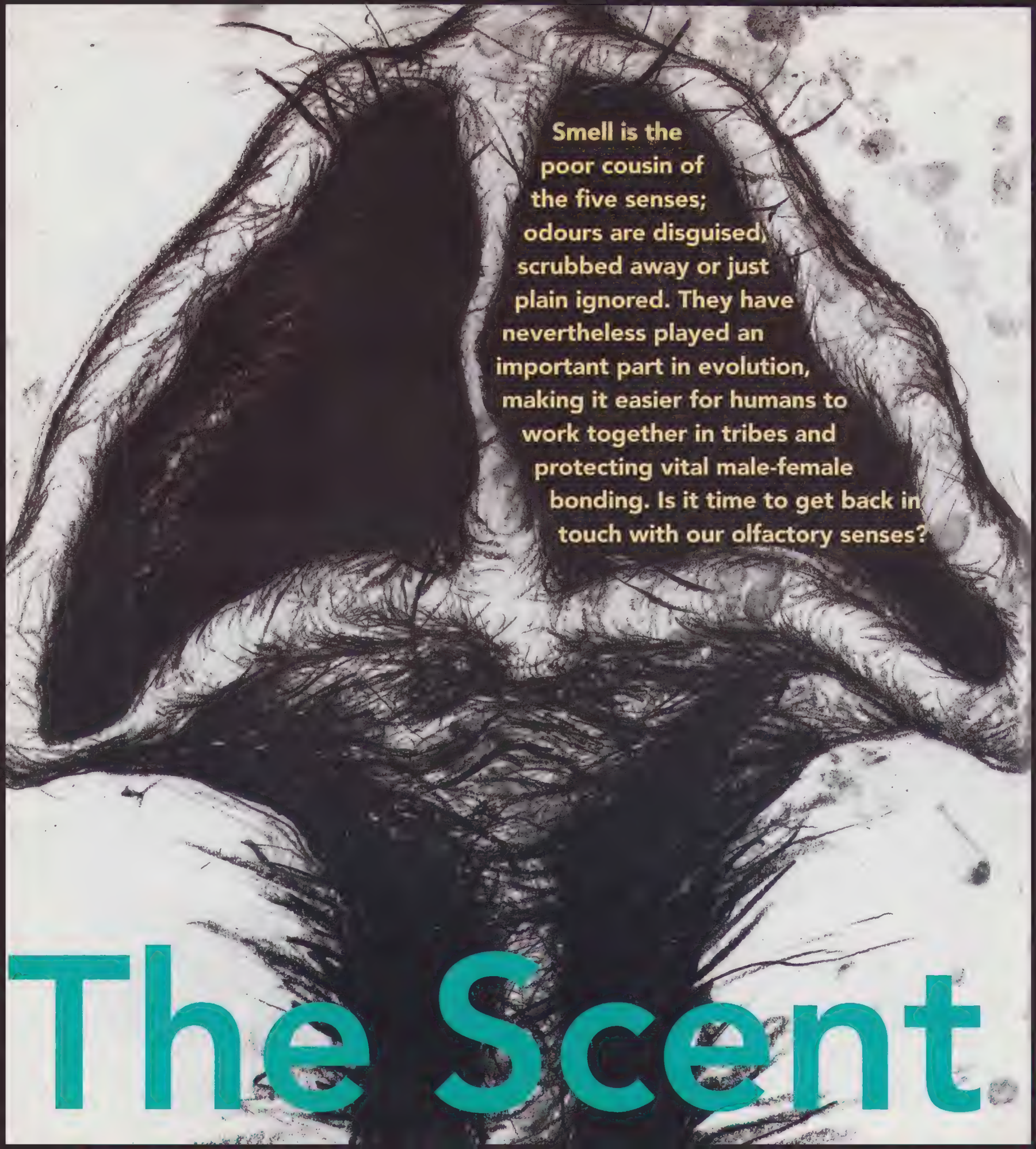
Both CDs clearly demonstrate the most seductive aspect of the digizine: the sense of direct access to culture. Because they let you both read an interview and watch it taking place, or listen to the music that the reviewers critique, these magazines banish the veneer of exclusivity cultivated by most chronicles of hip. There is no privileged editorial voice here; in fact, there is little editorial voice at all in either *Blender* or *Substance.* Text functions mainly to supply information; whatever opinions its writers may express are overwhelmed by imagery and graphical 'interior decor'. The most memorable parts of both magazines aren't the featured words, sounds, or pictures, but the animated 3D icons used to jump from screen to screen and the catchy incidental music that accompanies the jumps. It's like visiting a museum and remembering the elevator.

Cultural Blender: The digizine provides direct access to culture throwing together fashion, food and comics in day-glo colours

While both magazines lack the argumentative edge you get from traditional subcult publications, they do make excellent ear and eye candy. They provide enough up-to-the-minute pix, sound bites, and sensory overload to make you feel very much in the know – and why else would you go club-hopping? ■

Refrigerator Johnny from Blender

Below: Substance



The Scent

Smell is the poor cousin of the five senses; odours are disguised, scrubbed away or just plain ignored. They have nevertheless played an important part in evolution, making it easier for humans to work together in tribes and protecting vital male-female bonding. Is it time to get back in touch with our olfactory senses?

# of Man

BY MIKE STODDART

ILLUSTRATION BY LISA ROËT

WE LIVE THROUGH OUR SENSES. HUMANS ARE HOOKED ON sensory stimulation – newspapers are replete with ads for concerts, art galleries and restaurants enticing people to flock to these places and have their senses stimulated.

But why are there no ads for odour stimulation? Why has a culture of smell as a sensation not developed in modern humans? Why are we largely embarrassed by odour, and deeply shocked and offended if anyone should remark that we "smell"?

We go to great lengths to add odours artificially to our bodies, as long as we don't smell like humans. It's quite acceptable – even desirable – to walk around smelling like the anal gland secretions of an African civet, a beaver, or even a rutting Himalayan musk deer from all of which perfumes are generated.

This is not just a decadent foible of the late 20th century. When Cleopatra sailed along the Nile to meet with Mark Anthony 2,000 years ago, her barge was so perfumed that Plutarch observed "The winds were love sick...."

We squeeze, primp, and uplift various parts of our bodies to try to emphasise physical attributes or improve on nature. But when it comes to body odour, we pretend it isn't there. We scrub ourselves clean with evangelical zeal – and much soap – before pouring on artificial scents. As a zoologist interested in the evolutionary origins of human behaviour, I ask: might there be a biological reason for this?

There's a strong relationship between smell and sex. In the animal world, female moths can attract males from miles away by releasing tiny quantities of chemical mixtures called pheromones, and the smell of a bitch on heat can flush out a whole neighbourhood of male dogs. The earliest physicians admonished men to "abstain from warmth and women" at the first signs of a cold or catarrh, since venereal diseases were thought to irritate the nose. (It was not until early this century that the mechanisms linking nasal irritation to circulating sex hormones were discovered.)

But if smell is so important to animals, why have humans drifted away from it? One explanation is that, as juvenile dependency on human parents increased, we were subjected to a desensitisation of the sense of smell. It's a complex argument relying on recent advances in evolutionary genetics, but it may explain this.

In mammals, the female carries the young inside her until birth, which commits her to a great deal of parental investment. Her mate, in contrast, contributes little – the cost of sperm is low compared to the cost of eggs and subsequent brooding. His reproductive success – measured by the number of offspring he leaves behind – is best served by his mating with many females. But if the young are dependent upon their parents for training in hunting and other skills, the reproductive success of the male is best served by his close contact with his mate throughout pregnancy, lactation and during juvenile dependency In this way he can protect his investment and give it the best chance possible to survive and compete in a hostile world. This is not altruism – it is driven by genetic 'selfishness'.

A desensitisation of the brain to odours... has further strengthened the human male-female pair-bond, and has given rise to our ambiguous view of our own body odour.

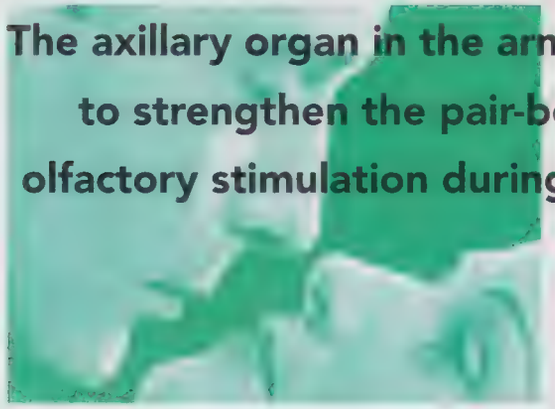
The term 'pair–bond' is given to whatever holds the male and female together until the young have left their parents. It follows that in species in which the young remain dependent for an extended period, the pair-bond must be very strong. Zoologist and author Desmond Morris in *The Naked Ape* notes the many anatomical and physical adaptations for the maintenance of the pair-bond in humans, and argues that the main mechanism is sex. Concealed ovulation, mammary gland development, orgasm, and continuous sexual receptivity – all are devices which help maintain the pair-bond. To Morris' thesis I would add the desensitisation of smell to odours associated with ovulation as another way of strengthening the pair-bond.

Two singular evolutionary events set our ancestors apart from most other animals and, consequently, freed their noses from purely functional roles. The first was a worldwide climatic change during the Miocene, about five to 10

million years ago. Our ancestors were forced to travel great distances in search of food, developing their hind limbs and becoming erect bipedals, losing their chimpanzee-like gait as they changed into plains dwellers. The nose was lifted high above the ground, and odours previously laden with information were subjugated to the clear visual images coming from well-developed stereoscopic vision. By doing this, humans began to intellectualise the world and abandon a sensory system which had served their ancestors.

The second big event was the move to hunting. In order to chase and kill large herbivorous mammals, our ancestors started to live in groups and form large hunting bands. This brought obvious ecological advantages in greater food supply, but also brought females into close contact with many males. This presented a problem for the pair-bond: whereas human females could previously advertise sexual readiness by producing odours, now they faced the risk of being fertilised by a stranger.

The odour of a complete stranger is seldom pleasant, but that of a lover can be exquisite. The axillary organ in the armpit, then, serves to strengthen the pair-bond by providing olfactory stimulation during sexual intimacy.



To protect the pair-bond, and allow the family unit to persist within the group, signs of being sexually available had to be downplayed. This was achieved not by a physical loss of odours, but by a desensitisation of the brain's ability to detect smell. In males, the olfactory brain became desensitised to oestrus odours, in response to the pressures of natural selection. This delivered benefits to their overall reproductive success – increasing the survival of the young – which outweighed any advantages derived from promiscuous matings.

Against this background of olfactory desensitisation, it is at first odd to find that humans possess a pair of well-developed scent-producing organs – the so-called axillary organs in the armpits. These are better developed in humans than in our nearest zoological relatives; chimpanzees and gorillas. Axillary organs are not 'secondary sexual characteristics', or characteristics specific to one sex that develop under the influence of sex hormones (such as facial hair in men), since they develop in both sexes and are equally well-developed in males and females. That they develop at the onset of sexual maturation suggests they do so under the influence of sex hormones, and thus, like other examples of physical adornment in animals, play a role in sexual biology.

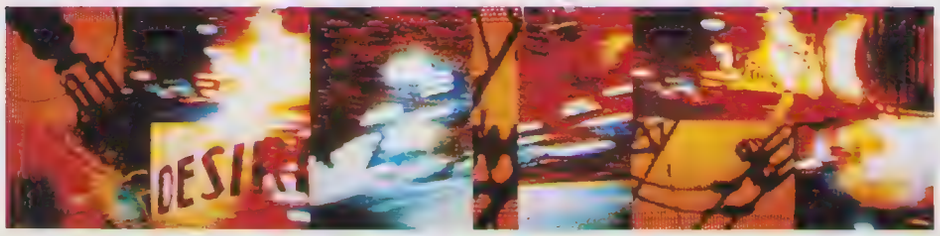
There is another possible scenario for the evolution of the human axillary scent-producing organ that strengthens the argument for olfactory desensitisation. Axillary organs are probably the remnants of other glandular tissue which covered the chin, neck and upper torso of ancestral primates. Under the influence of selective pressures for mutual mate choice, they have increased in size, and possibly also in secretory ability. The odour they produce contains steroid hormones, linking them with the sexual development status of the bearer. Their odour is mutually attractive when perceived during intimate sexual behaviour, but not when perceived in strangers. Their position, on the upper torso, tucked in under the arms, inhibits the release of their secretion in non-sexual behaviour, but encourages release of odour when sexual attention focused on the upper torso.

Axillary odour of a complete stranger is seldom pleasant, but that of a lover can be exquisite. The axillary organ in the armpit, then, serves to strengthen the pair-bond by providing olfactory stimulation during sexual intimacy. Although the notion of privatising ovulation strengthening the pair-bond is a speculative scenario, it is based firmly upon the role of odour in mammalian biology and the study of comparative zoology.

The evolution of the axillary organ is, similarly, speculative but based upon a growing body of knowledge about mutual sexual selection in monogamous animals. After all, the human olfactory system has not suffered physical reduction during evolution. Perhaps it's not surprising that sexual pheromones of plants and animals are used as perfume ingredients, and that humans find them arresting.

Our distaste for human odours – or at least, the odours of strangers – when coupled with a strong desire to create a world of artificial aroma around us, of fragrances which penetrate every part of our lives, makes the interplay between humans and odour an interesting paradox.

By recognising the part played by smell in our evolutionary past, and its importance to keeping humans together, our cultural notions of body odour can be better understood. Even if we still find the smell unpleasant. ■



...continued from page 35

AND THEY LIVED HAPPILY EVER AFTER...

So the moral of this story is that the barriers separating the telephone business from the cable TV business will come down, and then there will be a period of rapid experimentation with the delivery of entertainment services via the phone lines and new fangled telephone services via cable TV systems. There will also be an even more rapid turnover in alliances between program stock and flow owners, hardware and software developers, and delivery vector firms.

An investment tip? The consultants and the lawyers will make a killing – off the winners and the losers in the great infobahn carve up.

What this won't be is a grand cultural renaissance. Like the early days of mass print media or mass cinema, cheap and nasty entertainment will be the order of the day. Sport, porn, home shopping and movie re-runs will be the principle offerings for the new mass media. These areas may be only marginally profitable at best. Why pay for a subscription and a new box in the living room to watch stuff that is no better than so-called "free-to-air" TV? Because it won't be on free-to-air TV any more. A market thus forced into paying for what it used to get for next to nothing is unlikely to be in a generous mood, so the offerings will be lavishly advertised but basically banal. Such is the way new media begin.

More promising than television-based developments in many respects are to-the-home information services which take existing computer networking as the starting point. A majority of people will pay a little bit of money for simple video on demand. A minority of people will pay a lot of money to get newsfeeds they can edit and search at will, or libraries of specialised information relating to their business, profession or cultural interests. They already do. Thousands of people use dial-up computer bulletin-boards, commercial services like CompuServe or the academic community's Internet every day. The fastest growing media at the moment is the Internet – the network of, mostly academic, computers around the world which can pass messages to each other and on to individual users.

So there you have it. Owners of entertainment and information stocks and flows want new ways to deliver. Owners of delivery vectors want to build bigger pipes and want to be free to send all kinds of stuff down them. Manufacturers and software developers want to put a new box in every office and living room with a whole new bunch of software to run it, mostly sight unseen. The American government wants to clear away the obstacles to all this and grow a vast new post-industrial industry on existing American commercial strengths in new technologies and entertainment media – the military-information complex. And lastly there's a small, already existing community of people who already spend a lot of time and money on information either because that's how they make a living or that's their idea of recreation.

Beyond that, there's the glittering prize of brand new markets of millions of people who don't know that they want; video on demand or interactive multimedia or whatever yet, but will when they see it – or so the new media hype hucksters hope. And if they can convince us to want it, they might be able to convince their bankers and stock holders to put up the money to build it. The fairy stories are there to create a market for something that doesn't exist. Once we want what isn't there, then whoever created the most appealing fantasy about this non-product for this non-market can most likely raise the money on this dream to make the dream a reality. And you thought *Star Trek* was far-fetched? That Cinderella was a con? That's nothing compared to postmodern military-entertainment capitalism – the biggest, brightest dream of them all. ■

What this won't be is a grand cultural renaissance. Like the early days of mass print media or mass cinema, cheap and nasty entertainment will be the order of the day

BY VAÇLAV HAVEL

Ideologies are crumbling, old alliances are waning and Western liberalism, long thought a bedrock of the modern world, is looking vulnerable. Even science is becoming unsure of itself. It is the close of an epoch, but what will replace it? Here the President of the Czech Republic explains his vision.

THE AGE OF

THERE ARE GOOD REASONS FOR SUGGESTING THAT the modern age has ended. Many things indicate that we are going through a transitional period, when it seems that something is on the way out and something else is painfully being born. It is as if something were crumbling, decaying and exhausting itself, while something else, still indistinct, were arising from the rubble.

The distinguishing features of transitional periods are a mixing and blending of cultures and a plurality or parallelism of intellectual and spiritual worlds. These are periods when all consistent value systems collapse, when cultures distant in time and space are discovered or rediscovered. New meaning is gradually born from the encounter, or the intersection, of many different elements.

Today, this state of mind is called post-modernism. For me, a symbol of that state is a Bedouin mounted on a camel and clad in traditional robes under which he is wearing jeans, with a transistor radio in his hands and an ad for Coca-Cola on the camel's back. I am not ridiculing this, nor am I shedding an intellectual tear over the commercial expansion of the West that destroys alien cultures. I see it as a typical expression of this multicultural era, a signal that an amalgamation of cultures is taking place. I see it as proof that something is being born, that we are in a phase when one age is succeeding another, when everything is possible. Yes, everything is possible because our civilisation does not have its own spirit, its own aesthetic.

This relates to the crisis, or transformation, of science as the basis of the modern conception of the world. The dizzying development of science, with its unconditional faith in objective reality and complete dependency on general and rationally knowable laws, led to the birth of modern technological civilisation. It is the first to span the entire globe and bind together all societies, submitting them to a common global destiny.

At the same time, the relationship to the world that modern science fostered and shaped appears to have exhausted its potential. The relationship is missing something. It fails to connect with the most intrinsic nature of reality and with natural human experience. It

produces a state of schizophrenia: man as an observer is becoming completely alienated from himself as a being.

Classical modern science described only the surface of things, a single dimension of reality. And the more dogmatically science treated it as the only dimension, as the very essence of reality, the more misleading it became. We may know immeasurably more about the universe than our ancestors did, and yet it increasingly seems that they knew something more essential about it than we do, something that escapes us.

The same thing is true of nature and of ourselves. The more thoroughly all our organs and their functions, their internal structures and the biochemical reactions that take place within them, are described, the more we seem to fail to grasp the spirit, purpose and meaning of the system that they create together and that we experience as our unique self. Thus, we enjoy all the achievements

UNCERTAINTY

of modern civilisation that have made our physical existence easier – yet we do not know exactly what to do with ourselves, where to turn.

The world of our experiences seems chaotic and confusing. Experts can explain anything in the objective world to us, yet we understand our own lives less and less. We live in the post-modern world, where everything is possible and almost nothing is certain.

This state of affairs has its social and political consequences. The planetary civilisation to which we all belong confronts us with global challenges. We stand helpless before them because our civilisation has essentially globalised only the surface of our lives. But our inner self continues to have a life of its own. And the fewer answers the era of rational knowledge provides to the basic questions of human beings, the more deeply it would seem that people, behind its back as it were, cling to the ancient certainties of their tribe.

Because of this, individual cultures, increasingly lumped together by contemporary civilisation, are realising with new urgency their own inner autonomy and the inner differences of others. Cultural conflicts are increasing and are more dangerous today than at any other time in history.

Politicians are rightly worried by the problem of finding the key to ensure the survival of a civilisation that is global and multicultural: how mechanisms of peaceful co-existence can be set up and on what set of principles they are to be established.

These questions have been highlighted with particular urgency by the two most important political events in the second half of the 20th century: the collapse of European colonial hegemony and the fall of Communism.

The artificial world order of the past decades has collapsed and a new, more just, order has not yet emerged. The central political task of the final years of this century, then, is the creation of a new model of co-existence among the various cultures, peoples, races and religious spheres within a single interconnected civilisation. Many believe this can be accomplished through technical means – the invention of new organisational, political and diplomatic instruments. Yes, it is clearly necessary to invent organisational structures appropriate to the multicultural age. But such efforts are doomed to failure if they do not grow out of something deeper, out of generally held values.

In searching for the most natural source for the creation of a new world order, we usually look to an area that is the traditional foundation of modern justice and a great achievement of the modern age: to a set of values that were first declared in the revolutionary period of the United States. The respect for the unique human being and his or her liberties and inalienable rights, and the principles that all power derives from the people. I am referring to the fundamental ideas of modern democracy. But even these ideas are not enough. We must go farther and deeper.

Today, we are in a different place and facing a different situation, one to which classically modern solutions do

"Science has returned, in a roundabout way, to man, and offers him his lost integrity. It does so by anchoring him once more in the cosmos."

not give a satisfactory response. After all, the very principle of inalienable human rights grew out of the typically modern notion that man – as a being capable of knowing nature and the world – was the pinnacle of creation and the lord of the world.

This modern anthropocentrism inevitably meant that the Creator who purportedly endowed man with his inalienable rights began to disappear from the world: so far was he beyond the grasp of modern science that he was gradually pushed into a sphere of privacy of sorts, if not directly into a sphere of private fancy – that is, to a place where public obligations no longer apply. The existence of a higher authority than man himself simply began to get in the way of human aspirations.

"Politicians at international forums may reiterate a thousand times that the basis of the new world order must be universal respect for human rights, but it will mean nothing as long as this imperative does not derive from the respect of the miracle of Being, the miracle of the universe, the miracle of nature, the miracle of our own existence."

The idea of human rights and freedoms must be an integral part of any meaningful world order. Yet I think it must be anchored in a different place, and in a different way than has been the case so far. Paradoxically, inspiration for the renewal of this lost integrity can once again be found in science. In a science that is new, post-modern: a science producing ideas that in a certain sense allow it to transcend its own limits. I will give two examples.

The "anthropic cosmological principle" brings us to an idea, perhaps as old as humanity itself, that we are not at all just an accidental anomaly, the microscopic caprice of a tiny particle whirling in the endless depths of the universe. Instead, we are mysteriously connected to the universe, we are mirrored in it, just as the entire evolution of the universe is mirrored in us. With the "anthropic cosmological principle", science has found itself on the border between science and myth. In that, however, science has returned, in a roundabout way, to man, and offers him his lost integrity. It does so by anchoring him once more in the cosmos.

The second example is the "Gaia hypothesis". This theory brings together proof that the dense network of mutual interactions between the organic and inorganic portions of the Earth's surface form a single system, a kind of mega-organism, a living planet, Gaia, named after an ancient goddess recognisable as an archetype of the Earth Mother in perhaps all religions.

According to the Gaia hypothesis, we are parts of a greater whole. Our destiny is not dependent merely on what we do for ourselves, but also on what we do for Gaia as a whole. If we endanger her, she will dispense with us in the interests of a higher value – life itself.

What makes the "anthropic principle" and the "Gaia hypothesis" so inspiring? One simple thing: both remind us of what we have long suspected, of what we have long projected into our forgotten myths and what perhaps has always lain dormant within us. That is, the awareness of our being anchored in the Earth and the universe, the awareness that we are not here alone nor for ourselves alone but that we are an integral part of higher, mysterious entities.

This forgotten awareness is encoded in all religions. All cultures anticipate it in various forms. It is one of the things that forms the basis of man's understanding of himself, of his place in the world and ultimately of the world as such.

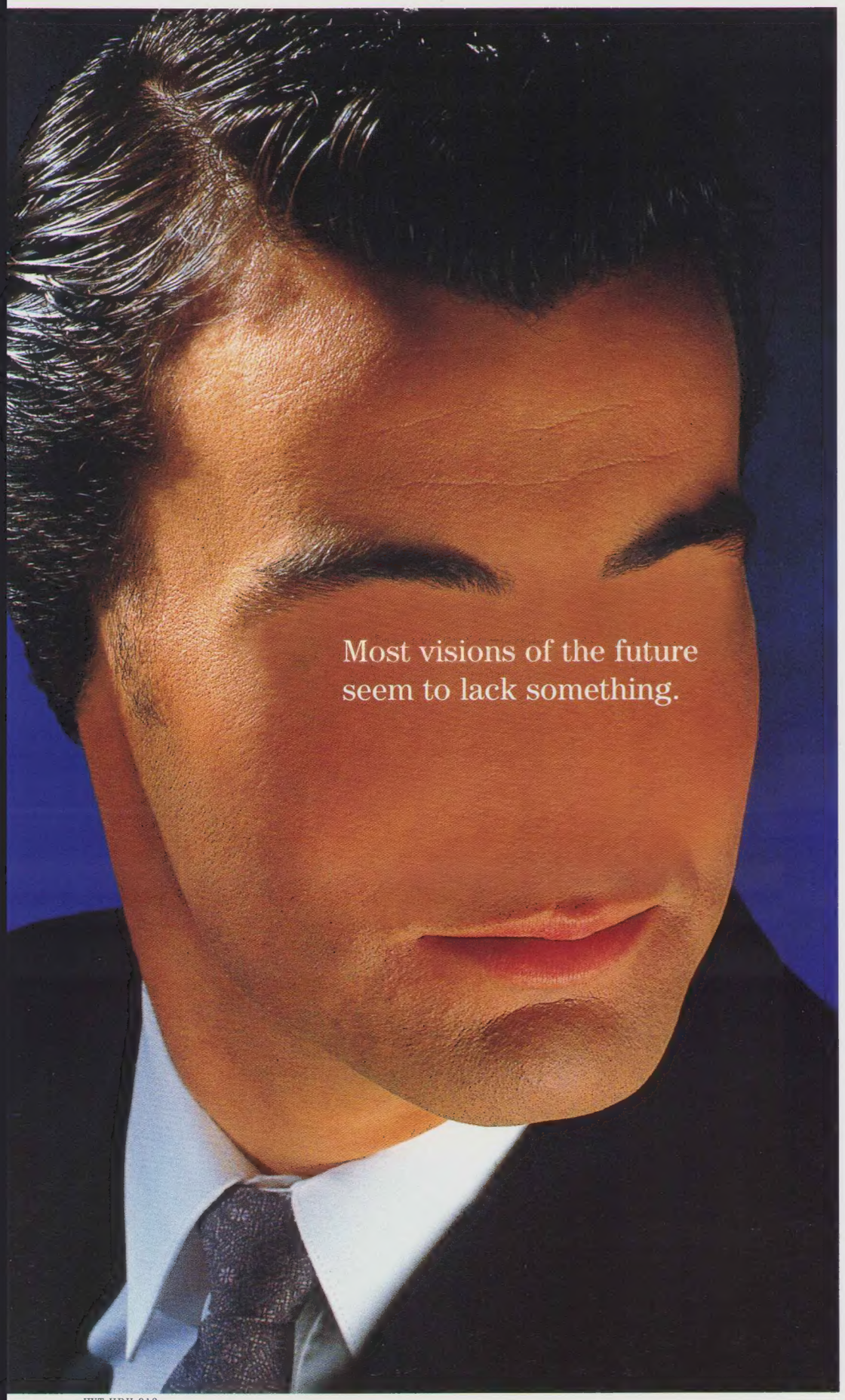
The only real hope of people today is probably a renewal of our certainty that we are rooted in the Earth and, at the same time, the cosmos. This awareness endows us with the capacity for self-transcendence.

Politicians at international forums may reiterate a thousand times that the basis of the new world order must be universal respect for human rights, but it will mean nothing as long as this imperative does not derive from the respect of the miracle of Being, the miracle of the universe, the miracle of nature, the miracle of our own existence.

Only someone who submits to the authority of the universal order and creation, who values the right to be a part of it and a participant in it, can genuinely value himself and his neighbours and thus honour their rights as well.

It follows that, in today's multicultural world, the truly reliable path to peaceful co-existence and creative co-operation must start from what is at the root of all cultures and what lies infinitely deeper in human hearts and minds than political opinion, convictions, antipathies or sympathies: it must be rooted in self-transcendence. ■

This article is an edited extract of a speech given at Independence Hall in Philadelphia, USA, on July 4, 1994.



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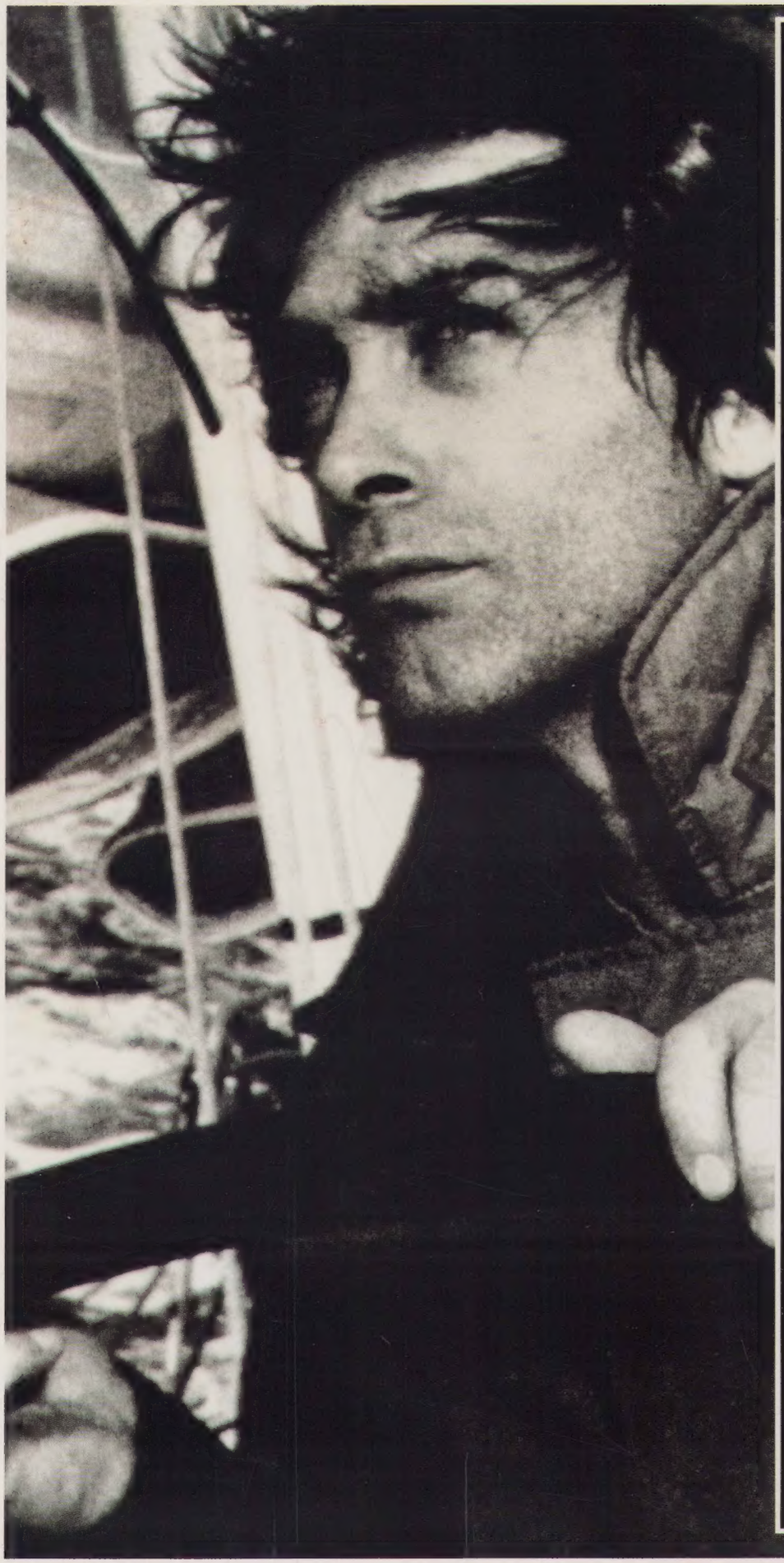

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